Subterranea

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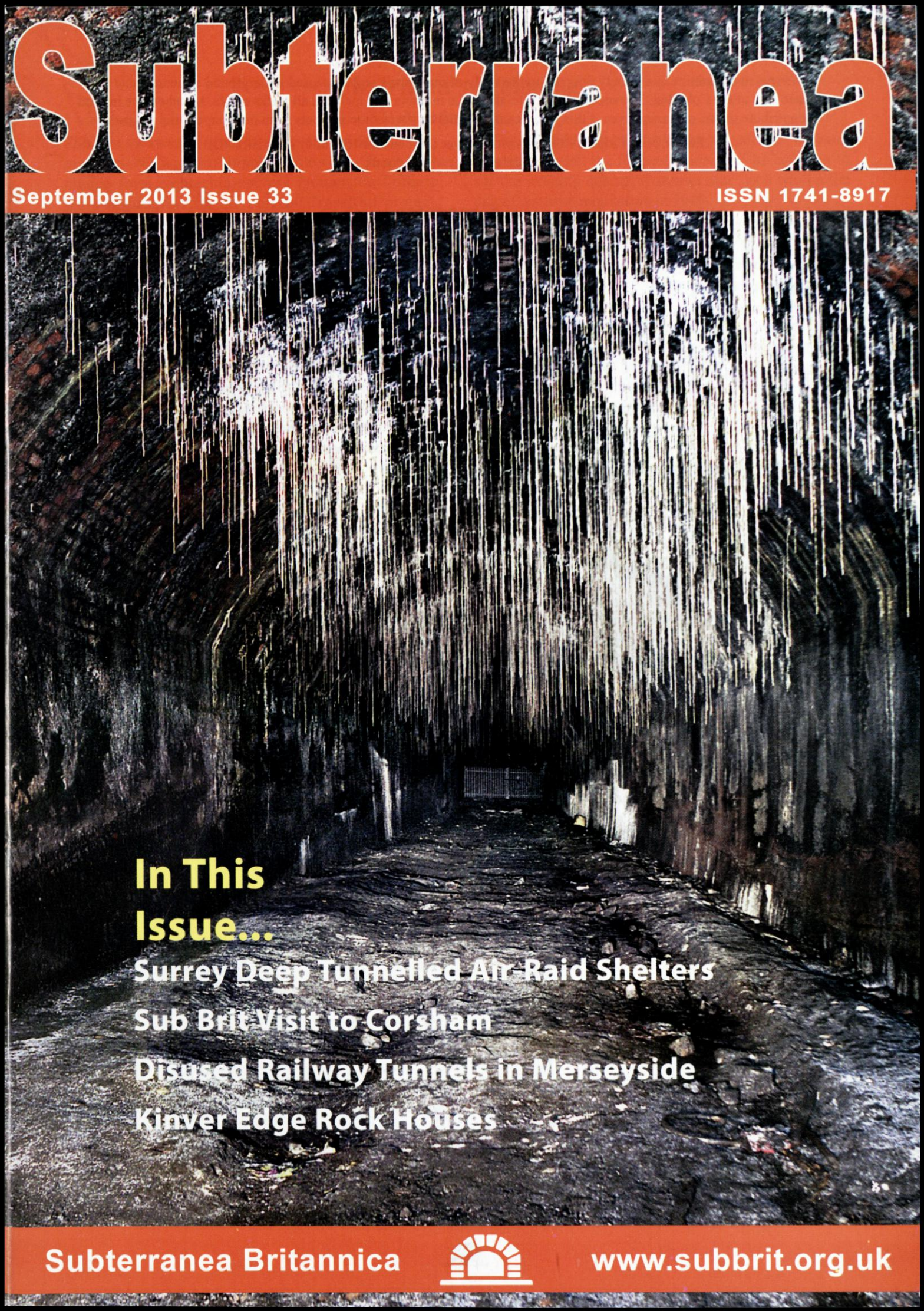

In This Issue...

Surrey Deep Tunnelled Air-Raid Shelters
Sub Brit Visit to Corsham
Disused Railway Tunnels in Merseyside
Kinver Edge Rock Houses

Subterranea Britannica www.subbrit.org.uk

Subterranea Britannica is a society devoted to the study of man-made and man-used underground structures and the archaeology of the Cold War. The society is open to all and its membership includes all walks of life. Members are invited to contribute to this magazine even if this just means sending very welcome snippets from newspapers and magazines.

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Contents

From the Chairman ____ 1
Dates for Your Diary ____ 2
Committee Meeting Notes – January 2013 ____ 2

News

Archaeology ____ 3
Conservation and Heritage ____ 4
Health & Safety ____ 4
Military and Defence ____ 4
Mines and Mining ____ 9
Miscellaneous ____ 11
Publications and Books ____ 13
Tunnels ____ 14

Features

Merseyside's Disused Railway Tunnels ____ 20
Ceaucescu's Bunker, Bucharest ____ 27
London Underground's Poster Art 150 ____ 28
Holy Austin Rock Houses at Kinver Edge ____ 29
Underground in Iceland: Þrihnukagigur ____ 33
Planning and construction of Surrey County Council's five World War II deep tunnelled air-raid shelters ____ 39
Sub Brit's weekend in Liverpool ____ 57
Corsham's Vast Secret Bunker – a Trip of a Lifetime ____ 66

Front cover photo: Stalactites hang from the roof near the west end of the Crown Street tunnel in Liverpool. The 291 yard single track tunnel was built in 1829 by George Stephenson between the Edge Hill cutting and the terminus of his Liverpool & Manchester Railway at Crown Street.
Photo Nick Catford

Back page upper: The eastern bore of Victoria tunnel in 1970. A Mersey Docks and Harbour Board locomotive had just travelled through the tunnel on its way to Edge Hill Yard. The tunnel was still used by the occasional passenger train at this time. It is interesting to see that British Railways had considered electrifying the Waterloo branch as wires have been erected right up to the portal.
To see what this tunnel portal looks like today see page 24.
Photo Keith Rose

Back page lower: The Sub Brit party at the top-secret Central Government War Headquarters at Corsham on 13 June 2013.
Photo Chris Rayner

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The committee of Subterranea Britannica and the Editor do not necessarily agree with any views expressed and cannot always check the accuracy of any material sent in.

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Chairman's Welcome

Martin Dixon

The first six months of the year have provided Sub Brit members with a record number of site visits. These have ranged from eighteenth-century Palmerston Forts to work-in-progress on the current CrossRail project. Geographically, locations have been from Dorset to Yorkshire and from Worcestershire to Kent. Not to mention a fascinating long weekend in and around **Göteborg** (Gothenburg) in Sweden. Many thanks to all members who have arranged trips and to site owners who have accommodated us. As well as being fascinating in their own right, such visits are always great opportunities to meet fellow members and share interests and thinking for the future.

One visit that is written-up in this edition of *Subterranea* is the one to the secret underground complex beneath Corsham in Wiltshire. Numbers on this were limited and the Committee felt that a ballot was the best way to allocate available spaces. Those attending had a simply marvellous day and are indebted to the Ministry of Defence for allowing the visit and for dedicating what turned out to be a full day to guide us round. As well as the Cold War Standby Government Headquarters, we were able to view much of the World War II installations in Tunnel and Spring Quarry that preceded it. We even managed to visit the furthest reaches of the complex to see the working quarry 'frozen in time' as it was on the day of wartime requisition in 1940.

Some 230 members applied for this visit so I know that leaves a lot of unsatisfied demand. Marcus Butcher's excellent write-up and the accompanying photos will I hope go some way to informing and compensating those who were unsuccessful.

Earlier in the year, parts of the Corsham complex were scheduled as ancient monuments. These areas now have the same protection as well-known national treasures such as the Tower of London and Stonehenge. Whilst this cannot guarantee survival, it recognises the importance of the site and under the legislation 'It is a criminal offence to destroy or damage a scheduled monument either intentionally or through recklessness'.

This scheduling is far from the first such for Cold War sites: other sites already scheduled include the Portland Rotor bunker, Neatishead Type-84 Radar Head, the Greenham Cruise Missile Silos and the underground complex at Dover Castle. We applaud the work of English Heritage (and their national equivalents elsewhere in the UK) to recognise and protect this most recent chapter in our long history.

The 'lucky few' stand at the bottom of one of the WWII escalators at Corsham. Photo Chris Rayner

At our last Committee meeting, we were able to approve a number of applications for funding for underground projects. As you know, we recently decided, wherever possible, to use our Gift Aid income to support new projects rather than existing activity. The two main criteria are that projects should have some demonstrable public benefit and, of course, some underground connection. Sites supported include a mine, a grotto and both WWII and Cold War shelters. Not all projects have to involve physical work and requests for funding research, publication and educational activities are equally fitting. Further applications would be welcome – there is an application form online at http://www.subbrit.org.uk/docs/reqfund.pdf.

I hope that everyone has taken the opportunity to escape from the early summer heatwave by relaxing in the cool of our underground heritage.

chairman@subbrit.org.uk

Notes of SB Committee Meeting – 15 June 2013

Chairman

Martin Dixon reported that the Annual Accounts & Trustees' Report had been filed on the Charity Commission website; they had been accepted, and were available for public scrutiny there. The Chairman said that the AGM had gone well, and thanked all those who had agreed to remain as committee members, and Richard West who had joined the committee. The trip to Gothenburg had been very successful, with 34 members participating, and arrangements were in hand for the forthcoming visit to Corsham by a small group of members. The Chairman and a half-dozen members had attended the London University Conference on 150 years of the London Underground, and a number of potentially useful contacts had been made. He had also agreed an extension of the Cotswold discount.

Finance

The committee's recommendation that subscriptions would increase in 2014 was approved at the AGM, although the committee would continue to explore ways of limiting expenditure increases – especially for publications, which represented a large part of Subterranea Britannica expenditure. The committee approved the allocation of grants to several projects – Birkenhead High School (leaflets), Blackmoor Mendip Lead Mine (gate & entrance repairs); Margate's Shell Grotto (new roundel); and Paddock (leaflet).

Website

Richard Seabrook reported that, although there were fewer unique visitors to the Subterranea Britannica website than in previous years, the number of pages served had increased and there was evidence that people were staying on the site longer and coming back more often. The construction of a new membership database was well advanced, and trials with committee members would begin shortly.

Meetings & Visits

Visits had been made to Portland, Holmpton, Ridgeway, Drakelow, Gravesend and Shorts at Rochester. Planning was under way for visits to Reigate Fort, Fort Southwick, Fort Widley, Colehouse Fort, Bletchley Park and The Intelligence Corps Museum, and information would be circulated when confirmed. Arrangements had been finalised for the weekend visit to Devon in the autumn, and 47 people had booked to attend. All four speakers for the Autumn 2013 meeting have been confirmed, and planning is well advanced for the Spring 2014 meeting.

Membership

Nick Catford reported that, after a high response at the beginning of the year, renewals had now dropped to a trickle. There had been a huge increase in May due to people wanting to go on the trip to Portland. Current membership is about 1100.

40th Anniversary

Noting that 2014 would be the fortieth anniversary of the founding of Subterranea Britannica, committee members agreed to explore potential locations for a celebratory function/visit. It was also agreed that a special supplement would be included in *Subterranea* looking back over the past forty years. The next committee meeting will be held on Saturday 12 October 2013; any members wishing to raise any matter should do so in writing to the Secretary at least two weeks before. **Roger Starling,** Secretary

SUBTERRANEA BRITANNICA DIARY

Summary of Forthcoming Events 2013

Sub Brit specific events

21 September Paddock open day

19 October SB Autumn meeting

18 January 2014 SB Committee meeting

For more information, email info@subbrit.co.uk or contact the Society concerned

Other underground-related events

12 - 15 September Heritage Open Days
www.heritageopendays.org.uk

21 - 22 September London Open House
www.londonopenhouse.org.uk

Current to 27 October Poster Art 150
London Underground's Greatest Designs at London Transport Museum www.ltmuseum.co.uk

September Doors Open Days, Wales
www.opendoorsdays.org.uk

September 1, 7 - 8, 14 - 15, 21 - 22, 28 - 29
Doors Open Days, Scotland www.doorsopendays.org.uk

14 September & 13 October World War II Walks at National Trust Coleshill. Coleshill House was the GHQ for the Auxiliaries - Britain's Secret Resistance Organisation.
nationaltrust.org.uk/buscot-coleshill-estates/things-to-see-and-do/events

14 - 15 September Reigate Caves open day
www.wcms.org.uk/pages/club/reigate_caves.shtml

14 - 15 September Banwell Bone Cave, Follies and Tower, Somerset
www.banwellcaves.org/page4opendays.html

14 - 15 September European Heritage Open Days, Northern Ireland
www.discovernorthernireland.com/niea/ehod.aspx

27 - 29 September Hidden Earth – the UK's annual caving conference, South Wales
www.hidden-earth.org.uk

18 - 27 October Wealden Cave and Mine Society Nenthead Mines week, Cumbria
www.wcms.org.uk

November tba Aldwych Station tours run by the London Transport museum.
www.ltmuseum.co.uk/whats-on

NEWS

Miscellany compiled by Paul Sowan and Nick Catford

NEWS – ARCHAEOLOGY

Upper Palaeolithic art in Cathole Cave, Gower, South Wales

The Gower peninsula, to the west of Swansea, is a limestone area possessed of several natural caves which have in prehistoric times been used by man. An engraving of a reindeer dated to the Upper Palaeolithic was discovered in Cathole Cave in 2012. The site is now scheduled as an Ancient Monument.

SOURCE: NASH, G.H., and A. BEARDSLEY, 2013, The survey of Cathole Cave, Gower peninsula, South Wales. *Proc. University of Bristol Spelaeological Soc.* 26(1), 73 – 83.

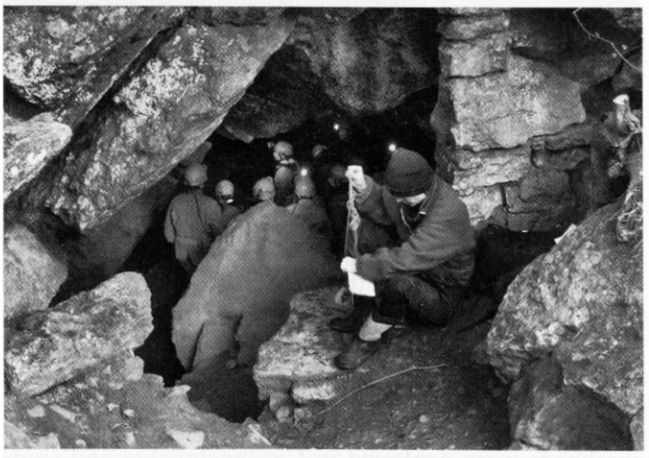
Neolithic human bones analysed from Hay Wood Cave, Mendip Hills, Somerset

Bones from at least ten individuals dating from over 5,000 years ago have been analysed and dated from Hay Wood Cave in the Mendip Hills. Modern techniques yield data representative of these people's diets, and suggest that although the site is less than three kilometres from the sea they ate predominantly land animals and plants, not fish or shellfish. The cave seems to have been used for the burial of the dead over some four centuries.

SOURCE: SCHULTING, Rick J., Margaret CHAPMAN, and E. John CHAPMAN, 2013, AMS ^{14}C dating and stable isotope (carbon, nitrogen) analysis of an earlier Neolithic human skeletal assemblage from Hay Wood Cave, Mendip, Somerset. *Proc. University of Bristol Spelaeological Soc.* 26(1), 9 – 26.

Goatchurch Cavern, Mendip Hill, Somerset

Goatchurch Cavern, in Burrington Combe in the Mendip Hills, is an entirely natural solution cave in limestone, but nevertheless falls into the category of man-used sites on the grounds that it has long been used to introduce novices to underground exploration. There is unrestricted access via a choice of two entrances. It is extensive and complex enough to be exciting, but too small to get lost in. It has ascents and descents calling for some agility, all rather well polished by youngsters enjoying their first underground adventure.



Entrance to Goatchurch cave

It is dry, but running water can be heard in the lowest depths. And it has been great fun from at least as far back as 1736. Many who have enjoyed it have gone on to more challenging underground environments in caves, mines, and even military and Cold War tunnels. Details of early unpublished accounts of this cave, from 1736 onwards, have been published by the University of Bristol Spelaeological Society.

SOURCE: BOYCOTT, A., and L.J. WILSON, 2013, Early accounts of Goatchurch Cavern, 1736–1874. *Proc. University of Bristol Spelaeological Soc.* 26(1), 37 – 71.

New survey of the long-established Gough's show cave, Cheddar Gorge, Somerset

Gough's Cave at Cheddar is a tourist cave and perhaps, for many, their first or even only experience of going underground. An impressively detailed new survey has been completed including parts beyond those reached by tourists, the published details being presented as a coloured plan and section of the three-dimensional maze. This is a notable achievement in view of the quantity of iron railways and the like installed for the safety of visitors!

SOURCE: MULLAN, G.J., and A. ATKINSON, 2013, A new survey of Gough's Cave, Cheddar Gorge, Somerset. *Proc. University of Bristol Spelaeological Soc.* 26(1), 27 – 36.

Convergence of Roman and 18th / 19th-century archaeology at Reigate Caves, Surrey

The largely complete sub-structure of a first-century AD Roman tile kiln was discovered during redevelopment of a garden at Doods Road in Reigate in 2004. The entire structure, ten or eleven metres long and three or four metres wide, was excavated by the Surrey County Archaeological Unit (SCAU), and all 30 or more tonnes of it lifted and removed elsewhere for storage and eventual re-erection. A Reigate Kiln Trust, a limited liability company and registered charity, was established to purchase the kiln (for £1) from SCAU and ensure its re-erection where the public could have access to it.

The Doods Road kiln in July 2004

After several years of searching for a suitable site, it now appears that one has been found, at least for the essential parts of the structure. The Wealden Cave and Mine Society (WCMS) have agreed to purchase the kiln

(again for £1) and re-erect the most significant parts of it in their developing underground museum in the Tunnel Road East sand mine in the centre of Reigate. The displays illustrate aspects of east Surrey's mining and quarrying industries, and of the wartime and Cold War use of the 'caves'.

The kiln substructure is of particular interest to WCMS members as its stokehole consists of four very large blocks of squared Reigate stone, implying that the local building-stone quarries (almost if not exclusively subterranean) had been commenced as long as over 2,000 years ago. The greater part of the fabric is of Roman tile-bricks held together mostly by clay.

The kiln superstructure, in which goods were fired, has not survived. Archaeologically significant associated finds are still held by SCAU pending production and publication of a complete formal archaeological report on the kiln, but may eventually also be displayed in the 'cave', where guided public tours are held on five summer Saturdays each year, and guided group visits at other times by arrangement.

SOURCE: *News of the Weald* 88 (April 2013), page 2 / Paul W. Sowan

NEWS – CONSERVATION AND HERITAGE

Wealden Cave & Mine Society wins Conservation Award, Surrey

The Wealden Cave & Mine Society's developing Reigate Caves visitor attraction, in former sand mine tunnels off Tunnel Road in the centre of the town, has been commended by the Surrey Industrial History Group. The Group has for over twenty years recognised conservation projects at industrial sites throughout Surrey, awarding commemorative plaques to be displayed at them.

SOURCE: *News of the Weald* 88 (April 2013), page 2 / Paul W. Sowan

NEWS – HEALTH AND SAFETY

Cave and mine accidents in 2012

Since 1994 the caving magazine *Descent* has published details of the British Cave Rescue Council's rescue statistics (see also www.wildplaces.co.uk for a searchable index to the magazine). Cave rescue teams attend and assist at a variety of incidents, a number of which are surface searches and false alarms.

Of the 28 incidents in 2012, all but six related to caving in natural caves. Of those incidents more or less directly relevant to Sub Brit's primary concern, man-made and man-used underground space, two related to members of the public in show caves, Gough's Cave at Cheddar (Somerset) and Blue John Cavern at Castleton in Derbyshire.

One was a fruitless search in and around Machynlleth (North Wales) for April Jones, a missing five-year-old girl, who a court decided in 2013 had been murdered and her remains disposed of by means unascertained. One was a false alarm arising from the sighting of what might have been a 'suspicious object' three metres down in a narrow rift in a mine at Slinter Wood, Cromford (Derbyshire): the object proved to be an old and soggy cuddly toy! Another was a search for an elderly man 'missing' in a mining district near St Just (Cornwall); he was found alive and well on the surface.

The only serious incident relating to a man-made underground site was in east Surrey, where at what the report calls a 'hearthstone mine' (but is in fact an underground building-stone quarry) near Merstham, on 7 March 2012, a 29-year-old woman lost her footing on a wire ladder in the four-metre-deep entrance shaft: she suffered a dislocated ankle and was stretchered out of the shaft and taken to hospital for treatment.

SOURCE: ANON, 2013, The rescues of 2012. *Descent* 232, 34 – 36.

NEWS – MILITARY AND DEFENCE

Czech nuclear warhead store opens as museum

A former secret Soviet nuclear warhead store in the Czech Republic has been turned into a museum inviting visitors to learn about the Cold War.

The huge underground concrete bunker was ordered by the Soviet leadership and built in the mid- to late 1960s in a forest near the village of Misov southwest of Prague, 60 km from the west German border. It was one of three such places in the former Czechoslovakia, and a dozen across Soviet Warsaw Pact allies. Two in East Germany (former DDR) have been visited by Sub Brit members.

Inside the bunker, buried under a forest and protected by machine-gun posts, there are thick concrete walls, two pairs of heavy iron gates and four chambers for storing up to 80 nuclear warheads that could be mounted on missiles. A second bunker sits some 100 metres away.

A succession of smaller rooms hosts the remains of equipment, from loading cranes to helium and vacuum pumps used to maintain the warheads, a diesel generator, gas masks, air filters and various tools. All of this is now on display along with pictures and text about the arms race between the United States and the Soviet Union.

Short- to medium-range missiles that could carry nuclear warheads were deployed in Czechoslovakia and some

even provided to the Czechoslovak army. The warheads could be mounted on the rockets and fired within two hours to clear the path for the Czechoslovak army marching to Germany.

A 170-strong Soviet unit under direct command from Moscow was deployed here permanently. Soviet forces that invaded Czechoslovakia in 1968 pulled out after the fall of Communism in 1990-1991, including special units deployed at the three nuclear depots. Since then, the Misov bunker was used for storing tonnes of Czechoslovak banknotes which were removed from circulation when the country broke up in 1992, and as a storage place for the remains of 4,000 World War II German soldiers.

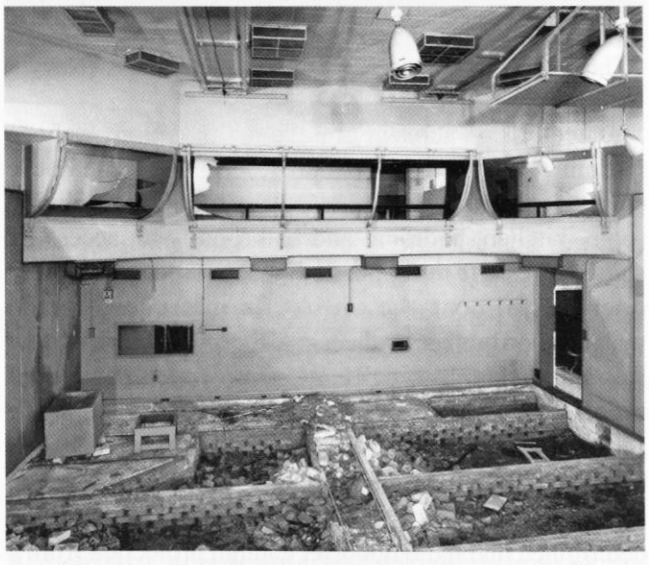
SOURCE: *Reuters* 17 May 2013

Two Newcastle upon Tyne bunkers to feature in new listening trail

Second World War RAF bunkers beneath Kenton and Blakelaw are to be made into a listening trail to raise awareness of their military history.

Once the home of 13 Group RAF Fighter Command, the bunkers coordinated the air defences of North East England, Scotland and Northern Ireland. Although the bunkers are now inaccessible to the public, Newcastle City Council has recognised their history and worked in partnership with residents from Blakelaw and Kenton, as well as local schools, to raise awareness of the underground military history through the audio trail.

The audio stories can be accessed at eight specially commissioned listening posts and benches between Kenton and Blakelaw. Using special receivers, it will be possible to listen to recordings of local people sharing their personal experiences, including the ground-breaking technology used at the bunkers.



The original 13 Group Fighter Command two-level operations room adapted for use as Region 1 Regional War Room in the 1950s. Photo Nick Catford

Receivers can be borrowed free from Blakelaw and Kenton libraries, reserved to collect from other libraries, or bought at the Visitor Information Centre in Newcastle city centre. Local schools are also being supplied with receivers.

The project was funded through contributions secured through the development of a residential estate around the Kenton bunker.

The bunker, which is now listed, received information from anti-aircraft installations, Royal Observer Corps posts, radar installations and other sources then directed fighter aircraft to their targets. Blakelaw bunker was later created as an information filter room to support Kenton. An appeal has also been issued for people's pictures and memories of the bunkers.

SOURCE: *Newcastle Chronicle* 1 August 2013

Himmler's bunker put on list for recognition as Ukrainian monument

The Hegewald, the former headquarters of SS chief Heinrich Himmler in Ukraine, has been put on the list for inclusion in the State Register of Immovable Monuments of Ukraine, the Ukrainian equivalent of listing. This has been done following complaints from local residents who objected to the bunker being converted into a potato store.

It is now felt that the bunker can be turned into a major tourist attraction that will help create new jobs and bring much needed income to the Zhytomyr region. Himmler's command bunker is located near the village of Huiva, 150 km west of Kiev.

SOURCE: *Kyiv Post* 30 July 2013

Gairloch AAOR (Wester Ross) finds new uses as a museum

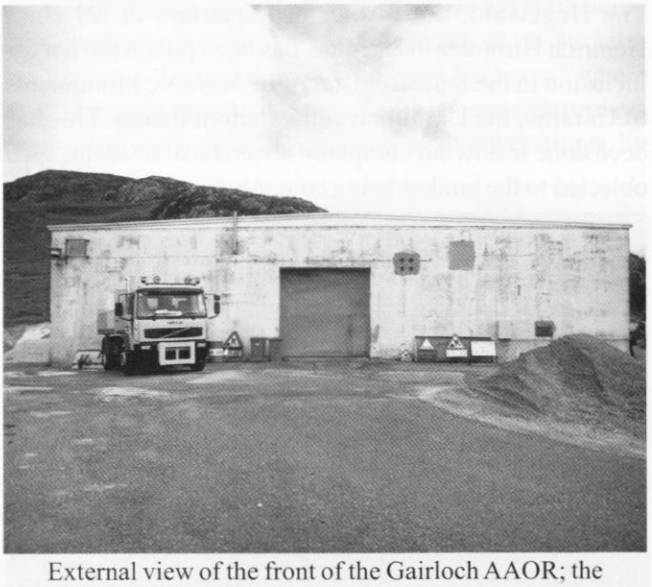
At the meeting of the Finance, Housing and Resources Committee of the Highland Council held on 28 November 2012, councillors agreed to support a recommendation that the redundant 'Roads Depot' in Auchtercairn be sold to the Gairloch and District Heritage Company for the sum of £1 to be developed as a heritage and community centre.

Since 1977 the Gairloch Heritage Museum has been a successful, award-winning tourist attraction, with full Museum & Galleries Scotland Accreditation and a Visit Scotland 3* rating. The proposal provides a viable heritage and community use for the redundant Roads Depot

[known locally as the 'Old Radar Station' – although it wasn't a radar station. *Ed.*]. This monolithic, blast-proof structure was built in the early 1950s Cold War period as an AAOR (Anti-Aircraft Operations Room).

The site is within the regeneration area identified in the Planning Brief for Auchtercairn prepared some years ago by the Council's Planning Service. The time is now right as the Museum has to vacate its current premises by 2015.

The council believe their plans illustrate how a local eyesore in the centre of the village, on the main A832 coastal tourist route, could become an attractive visitor centre with strong environmental credentials. The proposed transformation would avoid the costly and environmentally damaging demolition of the building.



External view of the front of the Gairloch AAOR; the roller shutters replace the original front entrance.
Photo Nick Catford

The Museum has commissioned and provided an architect's Feasibility Study and a Business Plan demonstrating how the building could be transformed and sustained to meet their needs. It also offers scope for other business and community users working in partnership.

The preliminary Heritage Report establishes the significance of the building within its Scottish and Highland post-Second World War context. The commitment to the transfer of this asset will enable the Museum to provide more Gaelic language and literature studies; traditional skills workshops and training; educational visits; archaeological and genealogical research; and heritage activities. It can expand its permanent and temporary exhibitions – currently it does not have the capacity to meet these increasing demands.

The old 'Roads Depot' will offer facilities for cultural events which are not available in the locality and become a community resource for mothers with toddlers and 'reminiscence groups' for older residents.

SOURCE: Gairloch Heritage Museum website – June 2013

Inverbervie Rotor Bunker (Aberdeenshire) for sale

A guardhouse and underground bunker with more than 10,000 sq ft of underground accommodation at Bervie Brow in Inverbervie on the Scottish east coast has been put on the market.

The Inverbervie Centimetric Early Warning Rotor Radar Station was built in 1952. It consisted of a single-storey bunker accessed from the standard design guardhouse/ bungalow built of local stone.

In the 1960s the site was taken over by the US Navy working in conjunction with nearby RAF Edzell where the US Navy's security group had their Oceanographic Monitoring Station monitoring the North Sea and the coast around the north of Britain. During this period the bunker was substantially modified and converted into two levels.

The US Navy moved out in 1978 and the bunker remained empty for six years until 1984 when it was taken over as the Armed Forces Standby HQ to Craigie Hall. The bunker was finally closed in 1993 and purchased by the current owner in 1999.

The 'new' two-storey control room built for the US Navy.
Photo Nick Catford

Situated in 2.68 acres of grassland, the station has been intermittently used for residential purposes. The house (formerly the guardhouse) itself contains a lounge, dining room, kitchen, bedroom and bathroom with access by spiral staircase to the upper floor where a second bedroom occupies almost the entire floor. Access to the underground bunker is adjacent to the lodge with a narrow sloping corridor leading 18 metres down to a network of rooms.

Last year American company Terra Vivos looked at buying the bunker as part of its network of underground shelters ahead of the end of the Mayan calendar, but determined that it did not offer enough protection from a nuclear blast.

Mark McQueen, an associate at Shepherd Chartered Surveyors, who are now marketing the property, said it could be used for a variety of purposes. "The substantial underground bunker has a corridor with 10ft-thick walls

and metal sliding doors offering an unusual level of security. The unique nature of this property makes it suitable for a variety of uses, subject to obtaining the necessary consents."

The lower floor of the bunker comprises a plant room, kitchen and toilets and twelve other rooms of various dimensions. On the upper floor there is a safe room and more accommodation, toilet and a kitchen. There is not an asking price for the property, with offers invited.

SOURCE: *Angus & The Mearns Courier* 1 July 2013 and Sub Brit website

Second World War shelter tunnels found at Southend primary school, Essex

Builders working at St Mary's Prittlewell CofE Primary School, in Boston Avenue, Southend, discovered a network of tunnels as they carried out excavations at the site to extend the school building to accommodate more reception pupils. The tunnels, which are still in excellent condition, are 6ft wide, 9ft deep, and run as long as 40ft beyond where the new classroom is being constructed.

They are made from reinforced concrete and run in a zigzag pattern that would have greatly lessened the effect of blast. The rest of the shelter has not been dug out and is believed to be under the playground. The tunnels have now been filled with concrete allowing work at the site to continue.

SOURCE: *Southend Echo* 31 July 2013

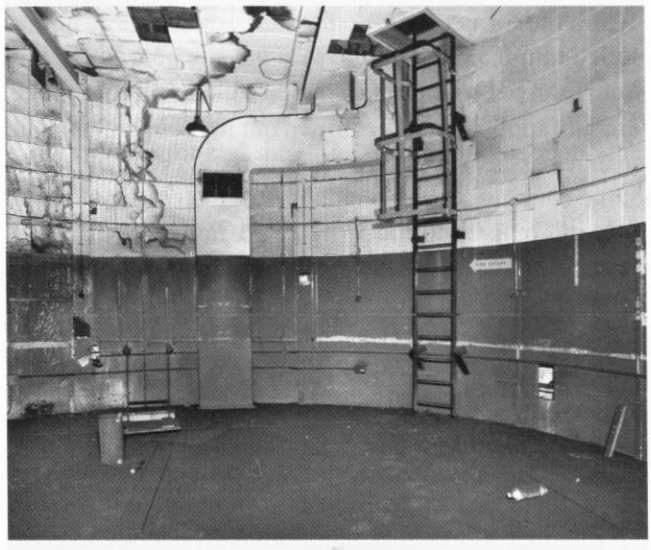
MoD to sell WWII Tube station command bunker, west London

A disused Underground station which housed the command bunker for London's anti-aircraft defences during the Blitz is to be sold off and is likely to fetch more than £20 million.

Brompton Road station closed in 1934 because of a lack of passengers, but gained a new life during the Second World War as an operations room controlling the guns fighting waves of Hitler's bombers.

The station in Kensington has been owned by the Ministry of Defence ever since. The MoD has now announced it will sell the 28,000-square foot building close to Harrods as part of cost cutting. The company handling the sale is expecting a high level of interest as it is a well located prime central London site providing an excellent redevelopment opportunity.

Brompton Road station opened in 1906 as a stop on the Piccadilly line and the building still bears the distinctive red-glazed tiles of stations designed by Leslie Green. The station closed 28 years later due to under use, but in 1938 the War Office bought the surface building along with lift shafts, stairs and some of the lower passages. The disused platforms were also used during the war but do not form part of the current sale.



Gun Operations Room 2 in the lift shaft; the ladder was for emergency escape up to GOR 1 while the trap door on the left leads down to GOR 3. Photo Nick Catford

The building became headquarters of the Army's 1st Anti-Aircraft (AA) Division, protecting the capital and surrounding areas. Floors were built into the lift shafts to create operations rooms complete with a telephone exchange, pneumatic tubes to carry messages and a huge table map of southern England. Information on approaching German aircraft reached the station from radar stations and observers, and was sent on to fighter squadrons and anti-aircraft batteries.

There have also been stories in the press and elsewhere that Rudolf Hess, Hitler's deputy, was questioned here after he flew solo to Scotland in 1941 in an attempt to negotiate peace. We can confirm that there is absolutely no truth in these stories. The building was used for anti-aircraft operations until the early 1950s, by which time the Second World War defences were considered obsolete.

The site now houses the London University Air Squadron, the London University Royal Naval Unit, and 46F Squadron Air Training Corps. An MoD spokeswoman

said these units would be found new homes before the sale in September.

John Taylor, estates surveyor for the Defence Infrastructure Organisation, which looks after MoD property, said: "The MoD keeps the size and location of its bases under constant review to ensure the Defence estate is no larger than necessary to meet operational needs and provides value for money for the taxpayer."

The MoD is selling off several historic buildings in London, including the Old War Office in Whitehall which is expected to fetch more than £100 million and become a luxury hotel.

SOURCE: *The Daily Telegraph* 29 July 2013

Developers appeal over Mistley bunker homes rejection, Essex

Housing plans for the Cold War bunker at Mistley could still go ahead after land owners launched an appeal. Plans to turn the former AAOR and museum into three homes with additional 28 dwellings on the site near Furze Hill were refused by Tendring Council's planning committee.

The site application was thrown out for being 'alien' and an unnecessary 'eyesore' in February this year. Members of the committee said neighbours of the site would have to compromise too much if the 31 houses were given permission. Now owners of the site have submitted an appeal against the decision.

SOURCE: *Harwich & Manningtree Standard* 14 July 2013

Fighter Command filter room at Watnall, Notts, to become a B & B

An old World War Two 12 Group HQ filter room in Watnall near Nottingham is set to be turned into a bed and breakfast.

The control room in the Watnall bunker. In recent years the bunker was used by a gun club. Photo Nick Catford

The bunker on land off Main Road was bought two years ago and Broxtowe Borough Council has now given planning permission for change of use from RAF bunker to mixed use comprising a dwelling with bed and breakfast guest bedrooms, extensions and ancillary facilities.

SOURCE: Broxtowe Borough Council planning application

Cold War visitor attraction, Koldkrigsmuseum Stevnsfort, Denmark

With most of Denmark being low-lying and flat, the choice of a site for a tunnelled Cold War bunker was effectively restricted to the country's two high cliff-lines (both of chalk), Stevnsklint and Mønsklint, both of which (fortunately) face the strategic sea route to and from the Baltic.

Stevnsklint, on the large island of Sjaeland (Zealand in English) was chosen as closer to København (it is a short way down the coast from the capital) and with a railway connection to nearby Rødvig. Mønsklint is on the small island of Møn, the nearest railway station being on an adjoining island to the southeast of København.

The fort (and a companion fort on Langeland) was designed to prevent the Warsaw Pact fleet in the Baltic gaining access to the world's oceans, and was constructed in 1950–53, decommissioned in 2000, and reopened as a Cold War museum in 2008. The main armament consisted of two armoured turrets, each with two 150mm SK c28 guns from the German World War II battle-cruiser *Gneisenau*. A Hawk missile battery was added in 1984.

The fort was a 'significant command centre and radar station for NATO', and was listed as a National Monument in 2012. Currently an estimated 1,499 Danish Cold War sites are being mapped, of which it is intended that 25 will be developed for public appreciation of this phase of Denmark's twentieth-century history.

Koldkrigsmuseum Stevnsfort is in the small coastal village of Rødvig, a short distance north of the railway station at the end of a branch line from Køge. There are 1.7 km of tunnels in the chalk, around 18 metres below ground level. The fort is open every day from April to October, and guided tours last 1½ hours.

For further information visit www.kalklandet.dk and www.stevnsfortet.dk

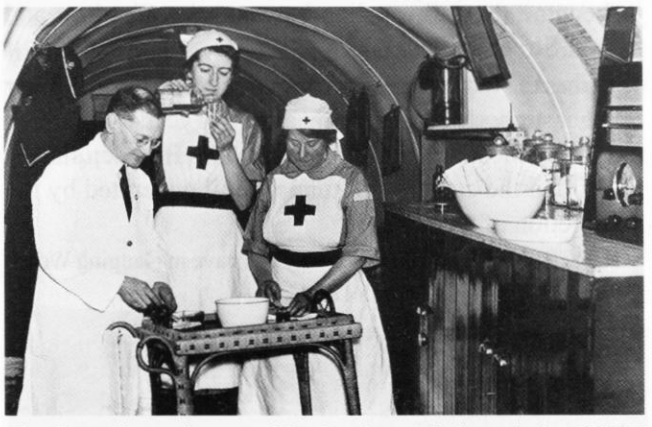
SOURCES: PEDERSEN, Thomas, 2013, Stevnsfort – managing a major fortification. *Casemate* 97, 13 – 14.

Stockport air-raid shelters reopen to the public after refurbishment

The shelters in tunnels under the town south of Manchester have reopened and will give residents the chance to learn more about Stockport's historic past. Visitors will be given a glimpse into wartime Britain as the country's biggest air-raid shelters reopened at the beginning of July.

Carved into the natural sandstone cliffs beneath the town centre, the shelters were the largest collection of purpose-built wartime hideouts in the country. They protected up to 6,500 people from Nazi air raids during the Blitz as so few houses had cellars.

Guided through the underground 'village', visitors will hear about new information discovered by local historians. They will also hear from the families who feared for their lives seventy years ago during the war.



The first-aid post in one of the Stockport shelters during WWII

The 21 tunnels, which opened in 1939 and are a mile long, were dubbed 'Chestergate Hotel' after a town-centre road by locals because of its top-quality facilities: electric lights, benches and bunk beds, as well as 16-seater flushing toilets. There was also a first-aid post, a sick bay and gas masks.

When the shelters first opened to the public in 1996 they became an award-winning attraction. Tourists and historians from all over the world flocked to the shelters before they were shut earlier this year for refurbishment. Among the improvements, there will be a new gift shop and a refurbished reception area.

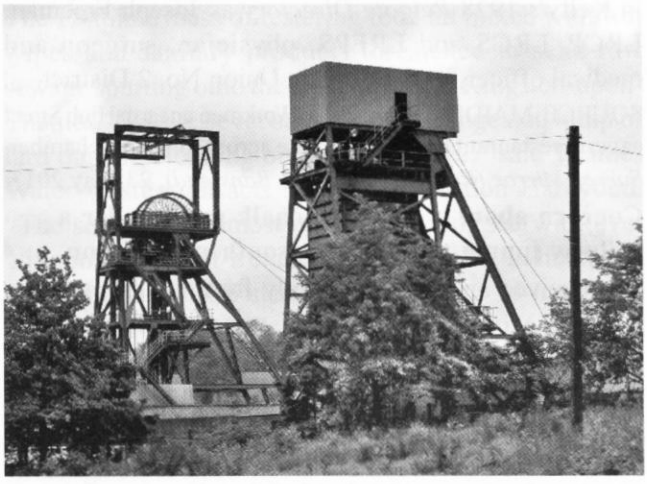
SOURCE: *Manchester Evening News* 29 June 2013

NEWS – MINES AND MINING

Fears that the closure of Daw Mill Colliery could mean the end for UK Coal

Following the underground fire which closed Daw Mill Colliery (a significant part of UK Coal), miners' unions are concerned that miners could lose out on redundancy pay if the company applies for voluntary liquidation. UK Coal admits the fire has left it with cash-flow problems, but says its business is still viable.

Most of Daw Mill's 650 staff will be made redundant at the end of May but could lose benefits if UK Coal begins insolvency proceedings. However, the firm has stated that the remaining deep mines at Kellingley in North Yorkshire, Thoresby in Nottinghamshire and six surface mines remain viable and discussions "are continuing with a wide range of interested parties".



Daw Mill colliery in September 2002. Photo Malcolm Street

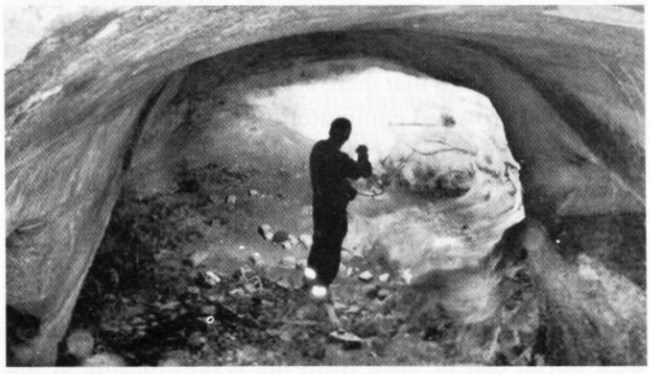
Over the past year, the company had announced a restructuring programme at Daw Mill and last August it said it was 'unlikely' the mine would remain open after 2014. At the time, UK Coal said it had made overall losses of £20.6m in the six months to 30 June 2012, with Daw Mill contributing to a 20 percent fall in production.

SOURCE: *Below* – quarterly journal of the Shropshire Mining Club, Summer 2013

New silver-sand rock-cut cellar or mine discovered in Reigate High Street, Surrey

Builders working on a new or refurbished restaurant at 65 Reigate High Street (called the *Giggling Squid*) have broken into what was described in the press as an unrecorded 'cave', interpreted as possibly a small sand mine. The void is estimated to have a volume of the order of 60 cubic metres, and it is suggested may not have been entered since about 1905. Features include rock-cut shelves and some numbers and letters carved into the sandstone walls.

The opening date for the restaurant was put back by an estimated four weeks. The proprietor has no plans to back-fill the cavity, and is making a feature of it, with lighting and a glass wall and ceiling.



The recently discovered sand mine below the *Giggling Squid*

This 'cave' was in fact recorded 'under the western portion' of this address in sale particulars relating to it in 1921, at which time it was tenanted by Dr J. Freeman who was then renting it for £60 per annum. He is listed in Kelly's 1928 *Reigate Directory* as Joseph Freeman, LRCP, LRCS and LRFPS, physician, surgeon and medical officer for the Reigate Union No. 2 District.

SOURCE: MAIDEN, Chris, 2013, Workmen unearth High Street cavern: restaurant builders stumble across long-lost chamber. *Surrey Mirror (Reigate, Redhill & Banstead)*, 23 May 2013

Concern about a probable chalk mine under a railway tunnel at Charlton, southeast London

We received an enquiry recently from a civil engineer working for Network Rail concerning cavities encountered during the driving of the very short Charlton tunnel (154 yards) on the North Kent railway line. The tunnel had been driven between 1847 and 1849 by John Brogden (junior) [1823–1867]. This line was opened to Charlton Station on 30 July 1849, but the next section to Woolwich Dockyard Station (opened 1 November the same year) was evidently slightly delayed by the tunnelling and the unexpected cavity.

The only published reference found to date is the following, from the *Kentish Mercury* of the time:

> During the operations of the workmen on the North Kent line of the South Eastern railway, when tunnelling under the hanging woods, at Charlton, near Woolwich, they came upon a cave, of considerable dimensions, cut in the chalk and flint rocks. A great quantity of sand has fallen at one end, choking up the side from which it has apparently been entered, and the workmen are now busily employed in shoring up a part of the roof of one of the chambers, the railway passing over its entire breath [*sic*]. Four chambers have been discovered, forming alternate recesses, from the main cave leading in a westerly direction. The roof of the cave is on a level with the line of railway, and the base 12 to 14 feet lower. The atmosphere in it is remarkably dry and pure, and presents a great contrast with the damp and close atmosphere experienced in passing along the tunnel to the extremity where the cave has been discovered. The men state they found a knife and a spoon on exploring it, and they turned their discovery to good account on Sunday, having lighted the whole of the tunnel with candles, and conducted visitors over the cave at the extremity, charging them 3d for admission.

Recent comment on the internet has raised the possibilities that the cavity may have been a chalk mine or a dene hole, and that there is a serious risk of a heavily loaded and crowded commuter train crashing through a collapsing tunnel floor.

Hanging Wood, since 1849 more or less quarried out of existence by Edwin Gilbert whose main interest was in winning Thanet Sand from above the underlying chalk, overlooked Charlton Lane from what is now the site of the Charlton Athletic football ground. The railway tunnel's west portal can be seen from the level crossing at the bottom of Charlton Lane, and its west portal from the Woolwich Road entrance to Maryon Park. Indeed, the park extends over the roof of the tunnel, which is at such shallow depth under such steeply sloping ground that both a dene hole and a tunnel spoil-extraction shaft both seem highly unlikely.

The railway tunnel seems to have been driven through chalk, immediately below the overlying Thanet Sand. Chalk at this geological interface is often subject to the creation of 'solution pipes' caused by percolating rainwater.

However, the feature discovered in 1849 seems most likely to have been a small drift mine for chalk, a notion supported by the scant details cited. Chalk digging and lime-burning were certainly carried on in this district before the railway was built. For example, Sarah Cutts and Glenton Lewis were listed as lime burners at New Charlton in an 1839 directory. Their chalk pits and lime kilns appear to have been one or both sides of what was to become the railway line between the Charlton and Mount Street tunnels.

Whereas the term 'shored up' would usually imply timber or other supports (which might after 164 years have rotted or rusted), the likelihood here is that John Brogden simply backfilled the cavity with tunnel spoil generated by the completion of the bore.

SOURCE: ANON, 1849, Discovery of a cave in Hanging Wood. *Kentish Mercury*, 24 March 1849.

Maltby Colliery closes

Hundreds of miners marched through the South Yorkshire town of Maltby in early April to mark the end of over 100 years of coal mining there. The parade led by the Maltby Miners Welfare band went to the town cemetery, where two wreaths were laid and a lump of coal buried.

Maltby Colliery, seven miles east of Rotherham, was one of the last deep mines in England. Hargreaves Services bought the colliery from UK Coal in 2007, and mining was expected to continue until 2015. In May 2012 the company said "unusual geological conditions" had emerged, with excess levels of water, gas and oil. Work to seal off the mine was completed at the end of June.

Maltby Colliery shortly before closure. Photo DR Vickers

About 250 people have lost their jobs as a result of the closure, while 150 have been redeployed to Hatfield Colliery, which is now the only remaining deep mine in South Yorkshire.

On May 24, the ShareCast news service announced that Alkane Energy, the AIM-listed independent gas-to-power company, completed the acquisition of certain of the coal mine methane assets of Maltby Colliery and associated £6m gross fund-raising. So it would appear that at least part of the mine will have a productive future.

SOURCE: *Below* - quarterly journal of the Shropshire Mining Club, Summer 2013

Boulby Potash Mine Expansion

Cleveland Potash has announced a major investment in Boulby potash mine, which should create more than 270 jobs by the end of 2015. Parent company Israel Chemicals Ltd is set to invest £300m in the mine over the next five years. Plans include extending the mine to the east and upgrading the production facilities. One of the first steps is the £16m replacement of the concrete winding tower at Rock shaft, which winds the mineral skips. The renewal will raise the amount of ore capable of being lifted to around 5.3 million tonnes a year, a one million tonne increase on the current maximum. The old 50-metre-high tower was blown up on 5 August and has already been replaced by a new tower.

The Rock Shaft tower is blown up on 5 August 2013

Underground equipment will also be modernised as well as the upgrading of the company's transport operation near Middlesbrough, which exports the potash mined at Boulby. The aim is to extend the life of the mine by at least another forty years.

SOURCE: *BBC News* 16 April 2013 and *Cleveland Evening Gazette* 6 August 2013

NEWS – MISCELLANEOUS

Another exploding manhole, London

Exploding manholes appear to be a modern phenomenon, which may or may not have any direct link with the privatisation of electricity supplies into fragmented companies. The latest report is of an explosion in Pimlico Road, Belgravia. This seems to have been the result of a fault in an 11-thousand-volt power cable, the responsibility of a firm called UK Power Networks. Three explosions occurred within yards of a pedestrian at 10.30 am on a weekday during the week ending 26 April.

SOURCE: LOEB, Josh, and Kiran RANDHAWA, 2013, Fireball on a London street as power cable blows up pavement. Buildings shake and flames shoot 10 feet high after three explosions. *Evening Standard*, 26 April 2013

Massive 'fatberg' found in Kingston sewer, Surrey

Repairs have started after Britain's biggest ever 'fatberg' – the size of a double-decker bus – was removed from a London sewer.

The 15-tonne mass of festering food fat mixed with wet wipes and sanitary products threatened to send raw sewage spurting onto the leafy streets of Kingston-upon-Thames. "We've never seen a single, congealed lump of lard this big clogging our sewers before," said Thames Water waste contracts supervisor Gordon Hailwood. "The sewer was almost completely clogged with over 15 tonnes of fat. If we hadn't discovered it in time, raw sewage could have started spurting out of manholes across the whole of Kingston. It was so big it damaged the sewer and repairs will take up to six weeks."

The foul blockage was discovered when residents of nearby flats complained they could not flush their toilets. Investigators found the 70 x 48cm sewer had been reduced to just five percent of its normal capacity. Mr Hailwood added: "Given we've got the biggest sewers and this is the biggest fatberg we've encountered, we reckon it has to be the biggest such berg in British history."

The Kingston fatberg

Workers used a high-pressure jet hose to blast away the massive blockage – but the size of the fatberg meant it took them ten nights of graft. Attached to the front of the hose is a stainless steel 'bomb'. This works by injecting fresh water backwards at very high pressure. This drives the head forwards through any blockages and up the brick sewer cleaning the brickwork and washing blockages backwards.

Thames Water wants the public to change their ways to help avoid another gigantic fat blob forming under London's streets. For fat, sanitary items and wet wipes – which do not break down like toilet paper – the message is "bin it – don't block it".

SOURCE: *Sky News* 6 August 2013

Crystal Palace Subway reopening contemplated, south London

After the Great Exhibition building of 1851 closed at Hyde Park it was, in 1854, relocated (in an enlarged form) on a hilltop at Sydenham alongside extensive and elaborately

ornate pleasure gardens. The London, Brighton & South Coast Railway immediately built a spur line to serve the Crystal Palace, as the building was called on account of its resemblance to a very large and elaborate greenhouse. So popular was this events and exhibition venue that a rival railway company built a separate line (including two tunnels) to a second station also to serve it.

The earlier (LBSCR) station was later developed with additional lines, from Croydon and onwards towards London Victoria, the latter extension running through a further tunnel. The two Crystal Palace stations were distinguished as Low Level (the first one) which was on the north side of Anerley Hill, and High Level, on the west side of Crystal Palace Parade.

Passengers arriving at the Low Level station had to climb to the top of the hill to reach the palace via a glass-ceilinged walkway, whereas the High Level station was at the top, alongside the building (Crystal Palace Parade running between the two). For the benefit of 1st class rail ticket-holders a very ornate polychrome brick subway was constructed from the station below the Parade leading straight to the Palace.

The subway below Crystal Palace Parade.
Photo Nick Catford

After the destruction of the Palace by fire on 30 November 1936, the need for two stations to handle passengers visiting the Palace was reduced, although by the mid-twentieth century an extensive urban development had taken place, the Crystal Palace district occupying parts of the London Boroughs of Lambeth, Southwark, Lewisham, Bromley and Croydon. Crystal Palace High Level Station, along with the subway, closed in the early 1950s.

This minor subterranean architectural gem has remained almost forgotten under the roadway ever since, although for some years it was opened once a year for visitors. There are now moves to reinstate public access, with a planning application filed with LB Southwark Council for an entrance from the west side of the Parade.

SOURCES: FRIENDS OF THE SUBWAY, 2013, Planning application made to LB Southwark for 'low-level' access to the subway under Crystal Palace Parade from the Southwark [west] side. *Norwood Review* 200 (Spring 2013); and *Crystal Palace Foundation News* 52 (May 2013)

Crystal Grotto at Painshill Park in Surrey reopens

The Crystal Grotto at Painshill Park near Cobham in Surrey has been fully restored and reopened to visitors on 29 June 2013. Modern-day visitors will now be able to experience the full visual and emotional impact of the magical Grotto for the first time.

Hundreds of thousands of crystals including calcite, gypsum, quartz and fluorite have been used to recreate this extraordinary folly, which dates back to 1760. Restoration of the crystal Grotto has been funded by the Heritage Lottery Fund and other donations by private trusts. It is one of the last follies to be restored within the landscape garden created by the Hon. Charles Hamilton in the Georgian Age of Enlightenment.

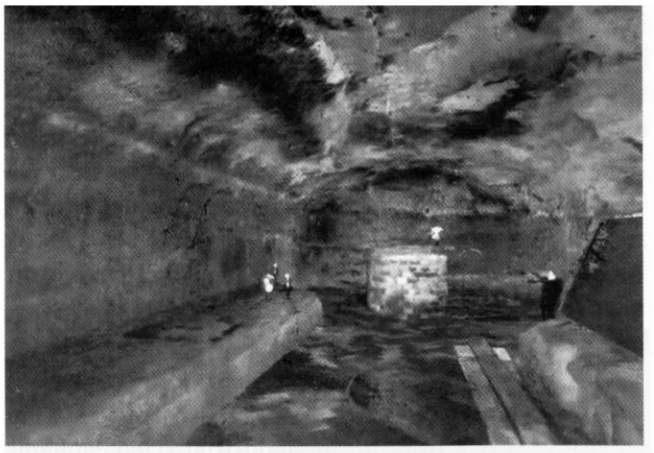
SOURCE: Painshill Park website, 2013

Music-hall pub in Nottingham expands into caves

A Nottingham pub based in a former Victorian music hall has been given permission to extend – downwards. The *Malt Cross*, on St James's Street, lies on top of a cave system that was once used by monks to store meat and beer. The owners hope to use the caves for music performances, dining, private functions – and possibly a brewery. The work will cost £1.5m and is expected to be completed by September 2014.

The two floors and two caves below the *Malt Cross* are currently lying derelict. The original drawings of the design of the music hall from 1877 show it was originally in four tiers. The lower floors would allow poorer people to hear, although not see, the music for free.

The *Malt Cross* was one of seven music halls in the city and is the only one still standing. The consortium of city-centre churches which runs the *Malt Cross* hopes a Heritage Lottery bid will cover the majority of the refurbishment funding, with the rest coming from other grants and donations. Planning permission for the project was granted by Nottingham City Council.



The long benches seen here were used for storing beer

The caves, which lie beneath the two unused floors, were originally used by monks from a Carmelite monastery which was based on the site. The caves have long, low benches which were used for storing beer. They have herringbone floors and a blocked well, which is supposed to go down about 70 feet. The *Malt Cross* will be working with the University of Nottingham to do an archaeological dig of the well.

The monks originally used these caves back in 1100 for brewing and storing beer. The consortium hopes to use the remainder of the Grade II listed building as an arts venue.

SOURCE: *BBC News – Nottingham* 5 August 2013

SOBERES wound up, Belgium

We regret to report that one of our sister organisations in mainland Europe, Societe Belge de Recherche et d'Etude des Souterrains, has been wound up although at the time of writing the reason is unknown.

We have exchanged our own publications, *Bulletin Subterranea Britannica* and *Subterranea*, with the SOBERES publication *Subterranea Belgica* since the latter was first issued in 1982. Our set of *Subterranea Belgica*, along with other periodicals received through exchange agreements, is held on the Society's behalf by Committee Member Paul Sowan.

Death of Rosemary Collett

Long-time member Linda Rosemary Collett died very suddenly and unexpectedly on or about 8 May 2013. She and her husband John attended day conferences, study weekends and other events in the last several years. Sub Brit was represented by several members at a memorial service for her at Christ Church, South Nutfield, Surrey on 29 May.

NEWS – PUBLICATIONS & BOOKS

SECRET UNDERGROUND LONDON

Nick Catford

ISBN: 9780-956440-570 Published May 2013

Hardback, 250mm x 250mm 282pp.

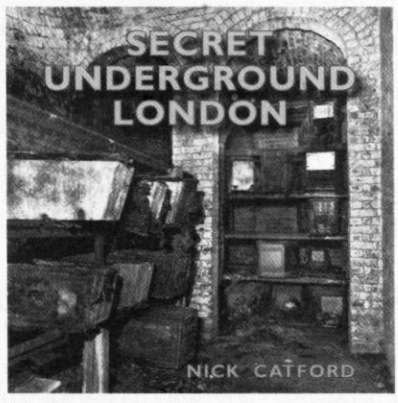
414 photographs, 50 plans and drawings

Review by James Lake

For the last thirty years Trench & Hillman's *London Under London* has remained the unsurpassed authority on subterranean London but today it seems distinctly dated and, in many instances, factually incorrect. In more recent years a number of other books have been published on the same subject but, sadly, most have been thoroughly disappointing. Anthony Clayton's *Subterranean City* (2010) was perhaps the best of the bunch, but focuses too much on the reasons why the capital's underground infrastructure was created and is rather light on descriptions (or illustrations) of the city's varied underground architecture.

Of the others, Peter Ackroyd's *London Under,* launched in 2012 with so much anticipation and acclaim, has been variously described by the critics as thin, uninspiring, dumbed-down and 'written in a hurry with little enthusiasm'. Similarly Alan Brooke's little 48-page book *Under London*, published in 2012, and Stephen Smith's lightweight, vague and journalistic *Underground London: Travels Beneath the City Streets* of 2005, have met with generally negative reviews from both the press and the general reading public. Nor has Fiona Rule's *London's Labyrinth,* published in 2012, been particularly well received, particularly when compared with her truly excellent earlier works on London, *The Worst Street In London* and *London's Docklands.*

The downfall with all these books, apart from their often woolly texts, is the paucity of adequate illustrations – both photographs and location plans – which are essential in this visual age, particularly where the sites described are not generally open to public view. And it is here that Nick Catford, in collaboration with Folly Books, continues to excel with the recent publication of his new title ***Secret Underground London***.



This is the third book that Nick has published with Folly Books and is arguably the best so far. Produced in the same 250 x 250mm format as his earlier *Cold War Bunkers* and *Burlington: the Government War Headquarters at Corsham*, *Secret Underground London* extends to 282 pages (the earlier titles were only 224 pages) , and is packed with an astonishing collection of well in excess of 400 photographs, almost all in colour, and some fifty beautifully produced plans and drawings especially prepared by Folly Books editorial staff or by Sub Brit's Tim Robinson.

Just about every aspect of underground London is encompassed by this book with the exception of the city's underground rivers which, as the author states in the introduction, are distinctly unphotogenic and are anyway already comprehensively dealt with in Paul Tilling's *London's Lost Rivers*. Similarly the Victorian sewage system, which has figured largely in many earlier publications, is only described in outline although one particularly unusual feature, the Abbey Mills pumping station and its underground boiler house and coal vaults, has a chapter to itself. Seventy-five pages are dedicated to disused tube stations with stunning contemporary photos which beautifully complement the earlier, archive photographs seen in J.E. Connor's excellent books on the subject.

A further fifty-five pages illustrate other, less well-known subterranean railway locations, including what is probably the first authoritative account of the Camden Horse Tunnels and beer vaults. Twenty-five pages of photographs illustrate the Deep Level Tube Shelters while two further chapters cover other air-raid shelters, large and small. Almost half the book is dedicated to the sinister collection of Second World War and Cold War control centres and other secret government bunkers which lurk beneath the city streets, to virtually all of which – somewhat surprisingly – Nick has been allowed access in order to produce this truly astonishing photographic record.

There is much else too, from cemetery catacombs to the Thames Barrier service tunnels, which space doesn't allow for inclusion in this review, but mention must be made of the extensive chapter on the Surrey Stone Quarries. The ramified network of long-abandoned quarry workings in the Godstone, Chaldon and Marden areas are little known outside a select few explorers and local historians, and the stunning selection of photographs included here will perhaps be something of an eye-opener to many readers. They have a double relevance to London, for not only are they underground within the geographical boundary set for this book, but they also provided the stone from which much of early London was built.

Subterranean City: revised and updated book on underground London

DETAILS: CLAYTON, Antony, 2010, *Subterranean city: beneath the streets of London. 2nd edn. Revised and enlarged.* London: Historical Publications Ltd: 264pp [ISBN 9781-905286-324]

The first edition of this well-illustrated book about underground London was published in 2000. This new edition has been extensively revised and issued with 70 additional pages and an extra 80 illustrations. It now includes sections on the Channel Tunnel Rail Link to St Pancras; Thameslink; the East London Line / London Overground; London Crossrail &c.

NEWS – TUNNELS

Liverpool gang jailed after turning railway tunnels into £2m cannabis bunker

Last December Mold crown court heard how a Liverpool gang turned two disused railway tunnels into a massive underground cannabis factory. The sophisticated factory, which had a potential £2m-a-year turnover, was described as one of the biggest cannabis farms ever uncovered in North Wales.

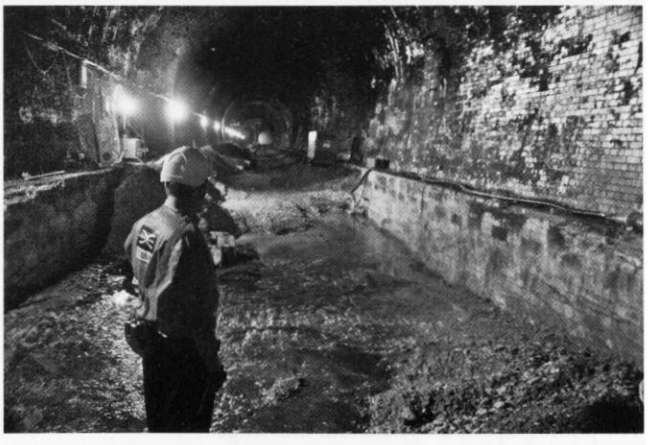
Two local men were each jailed for 3 years 4 months for their roles in the illicit operation, and two accomplices were each jailed for 12 months. A mushroom-growing enterprise was a front for the industrial-sized cannabis farm at the Faenol Tunnels near the Menai Bridge on the former Bangor and Carnarvon Railway which closed in January 1972.

Cannabis plants growing in the Faenol Tunnel

Two sets of heavy steel doors and internal steel gates completely sealed the site. A concealed trap door led to five large growing rooms, one of which had 1,207 plants in various stages of growth. Police raided the factory in May 2012 before any cannabis had left the site.

SOURCES: *BBC News Northwest Wales* 3 December and *Liverpool Echo* 4 December 2012

Connaught tunnel to be strengthened and widened and incorporated in Crossrail, London



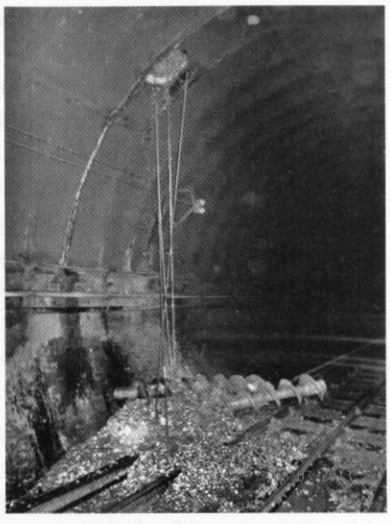
Crossrail at work in the Connaught Tunnel.
Photo Ian Mansfield

The disused Connaught rail tunnel, constructed in 1878 and closed in 2006, is to be strengthened, widened, and incorporated in the new tunnelled Crossrail route. The Royal Victoria Dock has been drained to allow access to the tunnel, which runs underneath it.

SOURCE: ANON, 2013, Dock above Connaught tunnel drained. *Modern Railways* 70(777), page 22.

Developers' piling auger penetrates live rail tunnel near Old Street station, London

The driver of the 10.02 Moorgate to Welwyn Garden City train on 8 March 2013 noticed muddy water pouring onto the roof of the train in the tunnel north of Old Street station. Traffic on the line was halted, and engineers despatched by special train to investigate. As they approached the location they were startled to see two ground augers (drills) penetrate the tunnel ceiling. Fortunately they stopped the train short of the intrusive equipment. Inspection at around 11.05 led to the involvement of the Rail Accident Investigation Branch and British Transport Police. Services on this length of line recommenced in 11 March. Your scribe seems to recall there was a similar incident on the Moscow Metro a few years ago.



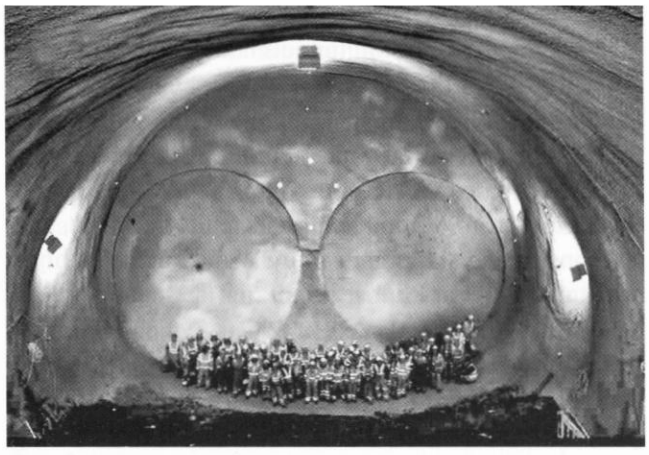
Two sections of the auger are seen lying on the track

SOURCE: ANON, 2013, Drills pierce Moorgate tunnel. *Modern Railways* 70(775), page 16.

Crossrail 'crossover cavern' at Stepney Green, London

London's Crossrail tunnels, currently 38 percent bored, consist of a parallel pair running eastwards from Royal Oak (west of Paddington) to junctions at Stepney Green, east of Whitechapel. A very large 'crossover cavern' is being excavated for the junctions 34.5 metres below Stepney Green. Here trains will be routed either onto the northeastern branch (in tunnel as far as Pudding Mill Lane) beyond which will be surface running via Stratford to Shenfield (Essex); or the southeastern branch (in tunnel via Canary Wharf and under the Thames to Plumstead) beyond which they will run on the surface to Abbey Wood. On the southeastern branch there are also to be short stretches of line at surface at Custom House and at North Woolwich.

The crossover cavern is 50 metres long, 13.4 metres wide, and up to 16.6 metres high. Seven thousand five hundred cubic metres of soil have been removed to create it.



The crossover cavern at Stepney Green

A report on the progress of tunnel-boring machines *Ada, Elizabeth, Mary, Phyllis, Sophia* and *Victoria* has been published. *Ada* and *Phyllis*, tunnelling eastwards, are now between the new stations at Bond Street and Tottenham Court Road. On the southeastern branch, *Sophia* (from Plumstead) has now broken through into the new station box at Woolwich (described in *Subterranea* 32) with *Mary* not far behind. They will be moved to the west end of the box where they will bore through the end wall to continue under the Thames.

Further west along the same branch *Elizabeth* bored through the east wall of the Canary Wharf station box at the end of May 2012, joined by *Victoria* on the parallel tunnel on 6 June. These machines, too, will now continue by tunnelling out through the west wall of the box, heading for the Stepney Green cavern.

Work can now commence on fitting out the station boxes. Platforms will be built, tracks laid, lighting and signalling installed, ventilation and drainage provided for, and escalators erected. Canary Wharf station will have eight escalators. What has been described as Europe's biggest civil engineering project is reported to be 'on time and on budget'. Trains are expected to start running in 2018.

SOURCE: HARVEY, Dan, 2013, It's a breakthrough! *Modern Railways* 70(778), page 98

Crossrail southeastern branch portal and terminus, London

The southeastern branch of Crossrail will pass below the Thames at Woolwich, emerge from tunnels at Plumstead, and terminate at a rebuilt station at Abbey Wood. At Woolwich an enormous concrete 'station box' has already been completed: this is 256 metres long, 26 metres wide and 18 metres deep. It is claimed that the tallest building at Canary Wharf could be laid in its side within this structure with space to spare.

The box was completed by Berkeley Homes, who are building residential property above it. However, funds are not yet in place for fitting out the new station with a booking hall, escalators, platforms, train indicators, public address system and so forth: an estimated £90m is required to complete the new station at Woolwich Arsenal.

When this site was visited by three Sub Brit members on 17 February the Crossrail tunnels had not yet penetrated the end walls of the box.

Down the line at Plumstead the new line will emerge from the tunnel portals and run alongside the existing North Kent line to its terminus at Abbey Wood. Balfour Beatty are to build from the portals to the terminus, with a reconstructed station at Abbey Wood and, possibly, a new train depot at Plumstead.

SOURCE: HARVEY, Dan, 2013, Plumstead job for Balfour Beatty. *Modern Railways* 70(775), page 82.

Ramsgate Harbour branch railway tunnel and air-raid shelter tunnels, Kent

There are proposals to reopen the Ramsgate Harbour branch railway tunnel, and the air-raid shelter tunnels that connect to it, with an award of £20,000 from Thanet District Council. These have been visited by Sub Brit members on several occasions in the past. More information at http://ramsgatetunnels.org

SOURCE: HARWOOD, Angie, 2013, Ramsgate tunnels update. *Newsl. Kent Underground Research Group* 109, page 7.

Report proposes the rebuilding of London's inner orbital road in a tunnel

Large stretches of London's main orbital road should be put into tunnels in a £30 billion scheme to improve the quality of life, according to a report commissioned by the Mayor of London. Cars, lorries and motorbikes would be sent underground on the North and South Circular roads to replace the congested routes with miles of space at street-level for residents, cyclists and pedestrians.

The bold proposal is greater in ambition than the current £15 billion Crossrail project under the capital and is the most eye-catching plan from the influential Roads Taskforce. It is the first strategic review for decades of London's roads which Boris Johnson believes have been overlooked even though they account for eighty percent of passenger trips.

Sources stress the tunnelling is not designed to make way for more cars but to improve the space at ground level for pedestrians, cyclists and parks while improving the environment by cutting vehicle emissions. They insist a radical solution is needed. Central London has lost thirty percent of its capacity for motor vehicles in a decade to schemes such as cycle lanes and pedestrianisation of areas like Exhibition Road. The task is made urgent because London's population is forecast to grow by 1.25 million by 2031, adding 14 percent to road congestion.

A further tunnel could be built to replace the Hammersmith flyover with a "flyunder" between the Hogarth roundabout and Earl's Court. Public spending on the projects could be subsidised by 'value capture' – a levy on new properties whose values would soar due to the improved environment.

Authors of the reports have been impressed by tunnelling schemes in Stockholm and Oslo to divert traffic underground and create greener cities. In the next stage, the Mayor will ask Transport for London to produce a feasibility study on individual projects.

SOURCE: London *Evening Standard* 9 July 2013

Future looks grim for residents above the collapsed Dingle Tunnel in Liverpool

Dingle residents are still no nearer knowing when they will be able to return to their homes. The setback comes exactly a year after the partial collapse of the tunnel in Dingle, which led to eleven properties being evacuated (see *Subterranea* 31, page 36). Those affected have all had to move into temporary accommodation while long drawn-out negotiations take place between Liverpool city council and insurance companies over the work needed to repair the tunnels.

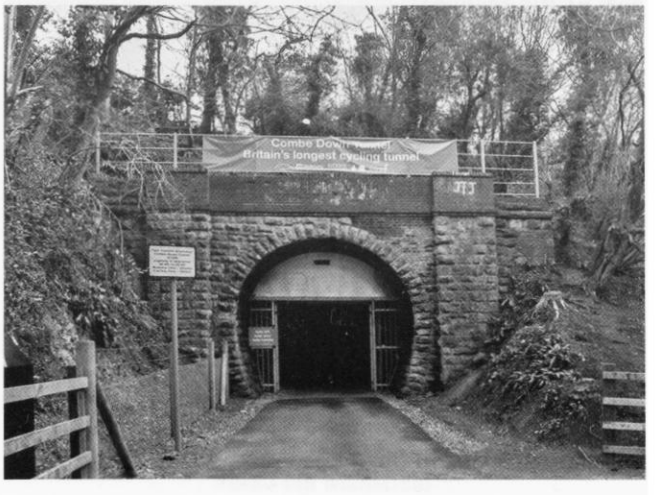
Despite agreement being reached earlier this year with insurers to help meet the cost of structural repairs, there is still no sign of any work starting. One resident, Maria Sullivan, who has not been able to return to her home in Sundridge Street since the tunnel collapse in July 2012, said: "We are still in a state of limbo. We had a meeting in May where we were told everything was ready to go and there were just a few details that had to be sorted out. Since then we've not heard a thing about when the work will start."

The section of tunnel which collapsed was formerly part of the Liverpool Overhead Railway system. The old Dingle station which was actually underground despite the name of the railway, had been converted into use as a car repair garage.

SOURCE: *Liverpool Echo* 24 July 2013

Combe Down tunnel to open to pedestrians and cyclists, Somerset

A 13-mile new footpath and cycleway incorporating a stretch of the northern end of the former Somerset & Dorset Railway (closed since the 1960s) was due to be opened on 6 April 2013. It includes the notorious Combe Down (or Midford) tunnel, a 1826-yards single-track tunnel with no air shafts (ie spoil extraction shafts) built in 1872–74. The tunnel is to be lit between 5am and 11pm each day, and runs uphill to the south.



The Somerset & Dorset line ran from Bath Green Park station (not the present Bath Spa station) via Midford and the Somerset coalfield to Bournemouth. The front of Green Park station survives, hiding a car park and Sainsburys store at the back. In and around Midford, to the south of the tunnel, there is attractive countryside, and much of interest to see, including the remains of the Somerset Coal Canal, William Smith's house, and well-preserved colliery remains and a good museum at Radstock.

When trains still ran on the Somerset & Dorset line (alternatively known to railway buffs as the Slow & Dirty or the Slow & Doubtful), the locomotive crew knew the 'very tight' single-track Combe Down tunnel for its poor ventilation, with smoke and cinders about their ears. In 1929 a driver and stoker on a goods train were rendered unconscious, resulting in a crash at the downhill (Bath) end in which the driver died, as did two goods yard workers.

SOURCE: MORRIS, Steven, 2013, Tunnel vision: the abandoned rail line turned into a green cycle path. *The Guardian* 23 March 2013, page 24

Butterley tunnel on the Cromford Canal scheduled as an Ancient Monument

A part of the Butterley tunnel on the Cromford Canal in Derbyshire has been scheduled by English Heritage as an Ancient Monument, along with associated early Butterley Company blast-furnace remains above it.

The part scheduled is a 210-metres (700 ft) length immediately below the works, including the 'Wide Hole' where goods were loaded and unloaded at canal level and raised or lowered by vertical hoists via two 100 ft shafts to the surface. This widened part of the canal tunnel is 180 feet long and allowed barges to tie up alongside wharfs whilst leaving space for through traffic to pass.

The tunnel as built in 1789–1794 was 2,978 yards long, with 33 vertical spoil-extraction shafts up to 57 yards deep, the excavations intersecting coal and ironstone seams exploited by the Butterley Company. It has been impassable as a result of roof falls since 1908.

SOURCES: ANON, 2013, Butterley tunnel protected. *Waterways World*, April 2013; and POTTER, Hugh, 2013, Butterley tunnel Wide Hole. *Jl. Railway & Canal Historical Soc.* 217 (July 2013)

Escape tunnel discovered at Sobibór Nazi death camp

A team of Polish and Israeli archaeologists believe they have discovered traces of an escape tunnel at the infamous Nazi death camp at Sobibor in eastern Poland.

Lying five feet below the surface, the tunnel stretched for 32 feet from one of the barracks and under the barbed wire fences surrounding the camp. Its discovery provides the first physical evidence of prisoners trying to dig their way out of a Nazi death camp. The length of the tunnel gives an indication of the ingenuity of prisoners desperate to escape a camp that claimed the lives of an estimated 250,000 in the 17 months of its operations in German-occupied Poland.

"We were excavating near where the sonderkommando barrack was and we came across two rows of buried barbed wire," said Wojciech Mazurek, from the archaeological team. "Digging down we found the traces of the tunnel. It was about as wide as a human, and we are 99 percent certain that it was an escape tunnel."

The sonderkommando was comprised of prisoners tasked with herding victims to the gas chambers and disposing of the bodies. Their function at Sobibor would have spared them the death on arrival that awaited so many of the camp's victims, and given them the time to excavate the tunnel.

The tunnel's discoverers believe it is unlikely that anybody ever used it to escape the camp. There were no reports of successful escape attempts from Sobibor until six hundred prisoners broke out during an armed uprising in October 1943. Experts said that the tunnel was probably discovered, and everybody who might have been connected with it executed. The excavation was apparently then filled in.

Its discovery has shed new light on the history of a camp of which little is known in comparison to other German extermination sites. Few people survived Sobibor. Not long after the uprising, Himmler ordered the camp to be razed to the ground and trees planted in an attempt to erase all traces of the facility.

SOURCE: *The Telegraph* 6 June 2013

Fiftieth anniversary of the infamous 'Beeching report'

Dr Richard Beeching [1913–1985] in his report published in March 1963 proposed the closure of over 15,000 miles of British railway tracks (6,000 route miles), a third (2,363) of the nation's stations, and the consequent abolition of 70,000 railway jobs. Insofar as his recommendations were adopted, this inevitably also led to the closure of a great many railway tunnels. Much of the track closure was achieved by reducing double-track lines to single tracks, such as for example of the main lines from London Waterloo to Exeter, and from Oxford to Hereford.

Now that railway passenger numbers are steadily rising, substantial numbers of closed lines and stations have been reopened; new stations built; tunnels reopened to traffic; and singled lines restored to double tracks. Other parts of lines, and several stations, have been reopened as 'heritage railway' tourist attractions. But significant parts of the former British Railway estate, especially the closed tunnels, remain the responsibility of the present national railway authorities.

What was not widely known in 1963 was that the Minister of Transport from 1959 onwards, Alfred Ernest Marples [1907–1978], had a vested interest in motorway construction through his partnership in civil engineering company Marples Ridgeway (he transferred his shares to his wife for the duration of his seat in the Cabinet) and, according to Poulton-Smith (2013) retired as an MP in February 1974 with a portfolio worth at least £350,000. On being investigated for conflict of interest and 39 years of tax evasion, Marples was found to have relocated all his assets abroad via a company registered in Liechtenstein, and fled to France, leaving his Belgravia home in disarray. Thereafter he lived in Monaco and France, where he died in 1978. Beeching, according to Poulton-Smith, did no more than Marples' bidding (whilst being paid £24,000 per annum – £14,000 more than Harold Macmillan, the Prime Minister of the day). Poulton-Smith's book lists all the passenger stations closed as a direct result of Beeching's report from which (with some trouble) a list of abandoned tunnels could be compiled.

SOURCES: BEECHING, Richard [Lord Beeching], 1963, *The reshaping of British Railways. Part 1: Report; Part 2: maps*. London: HMSO / British Railways Board: ii + 148pp; 13 folded maps.

CLOUGH, David N., 2013, *Dr. Beeching's remedy: a cure for a century of the railway's ills*. Hersham: Ian Allan Publishing Ltd: 160pp [ISBN 9780-711035-423]

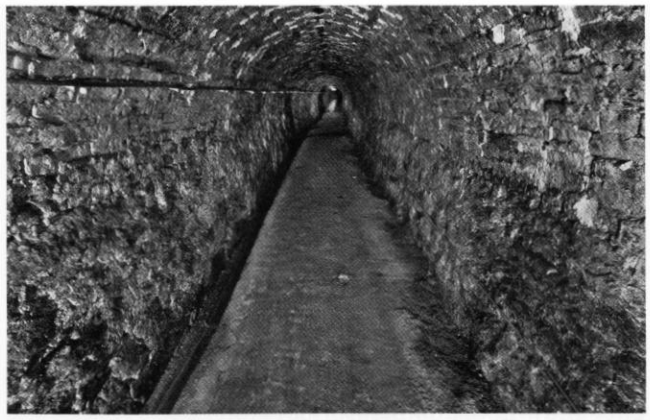
POULTON-SMITH, Anthony, 2013, *Beeching: 50 years on*. Stroud: The History Press: 174 + (2) pp [ISBN 9780-752480-923]

WILLIAMS, Alan, 2013, *50 years since Beeching: half a century of Government interference. Modern Railways* 70(775), 77 – 79.

New use for the Victoria Tunnel, Newcastle upon Tyne

The Victoria Tunnel, a four-kilometre tramway tunnel commenced on 27 June 1839 to link Spital Tongues (also known as Leazes Main) Colliery to staithes (jetties) on the river Tyne, has had several uses since it was formally opened to traffic on 7 April 1842.

It runs below the city, with its southern portal at the lower end of Tyne Street. The gradient is steeply downhill, the tunnel falling from 222 feet above sea-level to river level. Closed to coal traffic in or about 1857–60, it was reopened in part in 1939 when air-raid shelters were created with intermediate access stairways. Entrances other than that at Ouse Street were sealed up after the war, and in 1976



The Victoria Tunnel. Photo David John Harris

an 800-yard stretch from Ellison Place to Queen Victoria Road was adapted to accommodate a sewer.

It now appears that parts are again, at least from time to time, accessible to visit, as the London *Metro* has reported that a 'street art' event was to be staged in the tunnel on 12 June 2013.

SOURCES: CHAMBERLAIN, Alexander G., 1978, *The Victoria tunnel*. Tyne and Wear Industrial Monuments Trust: folded pamphlet

CHAMBERLAIN, Alexander G., 1999, The Victoria tunnel in Newcastle-upon-Tyne. *Industrial Heritage* 17(3)

HUGHES, Danny, 2013, Backstage pass into the dark. *Metro*, 6 June 2013

World's oldest railway tunnel discovered in back garden

Archaeologists have discovered a 220-year-old railway tunnel believed to be the oldest in the world. The historic Fritchley Tunnel, in Crich, Derbyshire, can be traced back to 1793, two years earlier than the previous record holder. The discovery was made after they linked the tunnel to a now-defunct railway, used by industrialists to transport limestone to an ironwork factory.

The dig began in January 2013 using heavy machinery to dig down three metres underground to reopen the sealed 18-metre passage. They have since discovered that the tunnel connected to the Butterley Gangroad, a horse-operated railway built in 1793 by the Butterley Company, a large local engineering firm.

The railway's purpose was to link the Cromford Canal with their limestone quarries in the area. It predates a 1795 tunnel on the Peak Forest Tramway, also in Derbyshire, by two years – this was originally thought of as the world's oldest. The £17,900 Heritage Lottery-funded investigation involved laser scanning to create a three-dimensional computer model of the inside. However, when the work is completed in September 2014, the group plans to seal up the tunnel again to preserve it for future generations.

The story goes back to 1977 when this tunnel was part of the abandoned railway. The owner of the cottage on the land wanted to build a rockery on the route. He contacted the owners of the railway and they said 'no'. So he paid £400 for a 700-yard stretch of the railway. It

didn't include the tunnel but the tunnel was accessed from his land. He then filled up that whole area so the tunnel got blocked.

The Butterley Gangroad was built in 1793 and is the oldest Derbyshire railway of which substantial remains survive. It was engineered by Benjamin Outram, one of the original founders of the Butterley Company, a large ironworks and engineering firm in Ripley, Derbyshire. Sadly, the firm went into administration in 2009 but it provided the ironwork for some of Britain's most iconic buildings, including London's Vauxhall Bridge and the roof of St Pancras station.

In the early years, the railway was horse-worked and carried limestone down from the quarries at Crich to the Cromford Canal at Bullbridge. From there the limestone was taken by boat to a tunnel under the Butterley Works and lifted up into the works for use in making iron. Like the early railways of the eighteenth century, the Butterley Gangroad featured horse-drawn carriages. But there was a limit to the load a horse-drawn system could carry and a typical 'train' moved between two and twenty tons at a speed of about four miles per hour.

Amazingly, the line was also the location of one of the first-ever trials of a steam locomotive. In 1813, William Brunton, an engineer at the company, used a 'Steam Horse' with 'legs' to propel itself along the track at 2.5 mph. The railway was then modernised in the 1840s and turned into a narrow-gauge railway, which was used by steam engines until 1933. In the Second World War, the tunnel was used as an air-raid shelter.

SOURCE: *Mail Online* 1 May 2013

New lines and rail tunnels in Austria

Austria lies at the 'cross-roads of Europe', its railways carrying long-distance passenger and freight trains between, for example, Germany and Italy, and France, Switzerland, Slovenia and Hungary. As seen from a railway carriage, it is a land of mountain passes and long tunnels under the Alps.

Your scribe has always entered and left Austria by way of the Arlberg pass and tunnel, and left via the Karawanken tunnel en route to Zagreb, and re-entered via the line from Italy over the Brenner Pass. But many lines are less than direct 'as the crow flies' and many gradients and altitudes are challenging. Not that a slow journey matters on a nice day, as much of the scenery is stunning!

However, the Austrian railway authorities are building and planning new high-speed lines all over and in and out of the country, including numbers of new long tunnels. An entirely new and more direct main railway line is taking shape on the Austrian railway system, linking St. Polten to Vienna. This includes two major tunnels, at Wienerwald and Lainzer. The Lainzer tunnel (12.8 km) opened to traffic in December 2012.

SOURCE: FENDER, Keith, 2013, Transforming the rail network in Austria. *Modern Railways* 70(775), 54 – 61

Subterranea Britannica Autumn Meeting 2013

Saturday 19 October, commencing at 10.00am

Royal School of Mines, London SW7 2BP

There will be the usual mix of interesting illustrated talks, including

Laurent Triolet on shelters and war tunnels in France, Cappadocia,

Afghanistan, Vietnam and Lebanon

Les Riley on North Lincolnshire Ironstone Mining

Robin Hill on the Frome Tunnels project

Mike Chrimes on London Underground: Civil Engineers & the Tube: 1863 to 1948

along with Members' contributions and a chance to

meet and mingle with fellow enthusiasts

The programme & booking form is on the website.

Please put the date in your diary now!

Merseyside's Disused Railway Tunnels

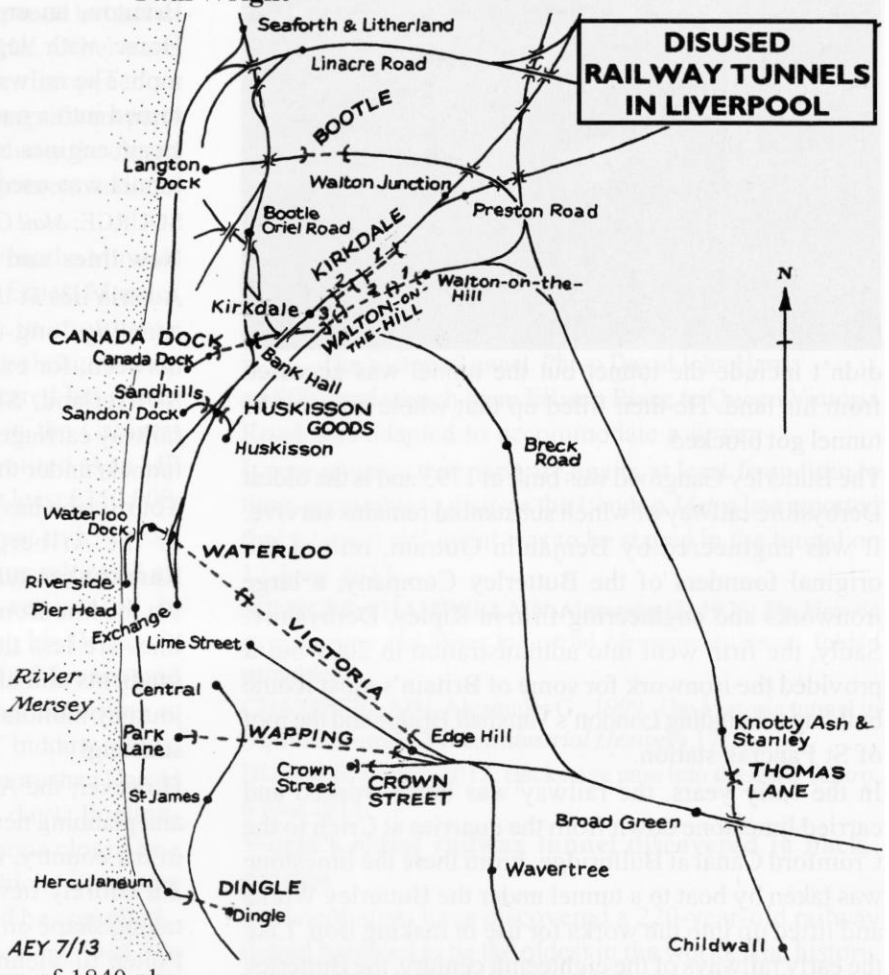
Paul Wright

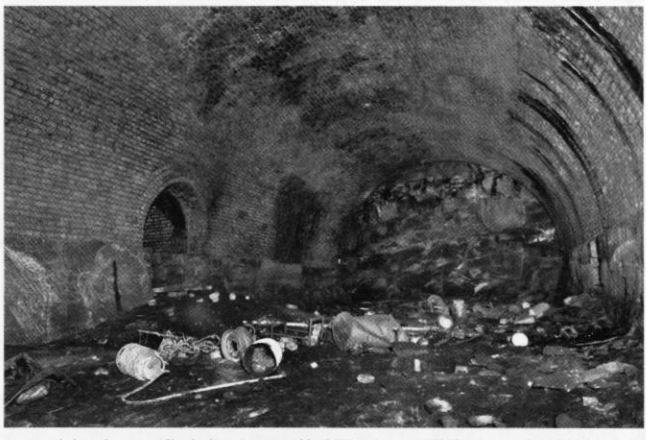
The Merseyside area has a rich heritage when it comes to railway tunnels. The world's first intercity railway was the Liverpool & Manchester Railway (L&M) which opened on 15 September 1830. Two of the major engineering features on that line were the Crown Street and Wapping tunnels at the Liverpool end of the line.

These early tunnels were necessary because of a range of sandstone hills that are present to the south, the east and the north of the city; the River Mersey lies to the west. In order to take the line down to the waterfront George Stephenson had no option but to tunnel.

The success of the L&M led to the period of railway mania that saw lines built all over the country by numerous private railway companies. By the nineteenth century Liverpool had become the second most important port in the country and it was not long before rival companies reached the city. All of them had to tunnel.

On the west side of the Mersey at Birkenhead a similar situation existed, and the Birkenhead and Chester Railway of 1840 also required a tunnel so that it could reach its riverside terminus at Monks Ferry. As the Liverpool dock system spread northwards, new rail links were opened and they too required extensive tunnelling.





Inside the unfinished parallel Walton Hill tunnel (Walton No. 1) looking south-west on 27 November 2012. The tunnel was constructed in anticipation of the line being widened to four tracks. Only the sections that required the cut and cover tunnelling method were completed and a sandstone rock face can be seen at the end of the unfinished bore. Engineers would have tunnelled through this at a later date, had the quadrupling ever been carried out. Photo Chris Iles

By 1894 all of the railway tunnels in Liverpool had been built. For the next 70 years they were intensively used but then came a period of contraction that saw many of the lines close. There are still many active railway tunnels in Liverpool, some of them dating back to 1836.

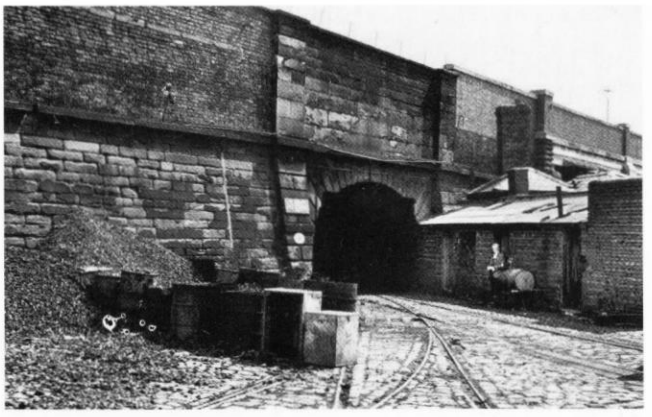
This article will look at some of the disused tunnels in the area and explain their history, why they went out of use and what their current condition is today. Not covered are the CLC Walton-on-the-Hill tunnels, an article on which appeared in *Subterranea* 23 (June 2010), and the Liverpool Overhead Railway Dingle Tunnel which was featured in *Subterranea* 31, December 2012.

The Liverpool and Manchester Railway – Crown Street and Wapping Tunnels

When the L&M opened on 15 September 1830 the western passenger terminus was at Crown Street. The limit of locomotive working was a short distance to the east at the Edge Hill cutting which was the location of the famous Moorish Arch. A tunnel was required to link Crown Street to Edge Hill cutting and this was the Crown Street Tunnel.

Engineered by George Stephenson, it was a single-track tunnel that was 290 yards long. The tunnel was 15 feet wide and 12 feet high, cut through sandstone and partially lined in brick. The tunnel was complete by 1829 but would only have come into regular use with the opening of the line.

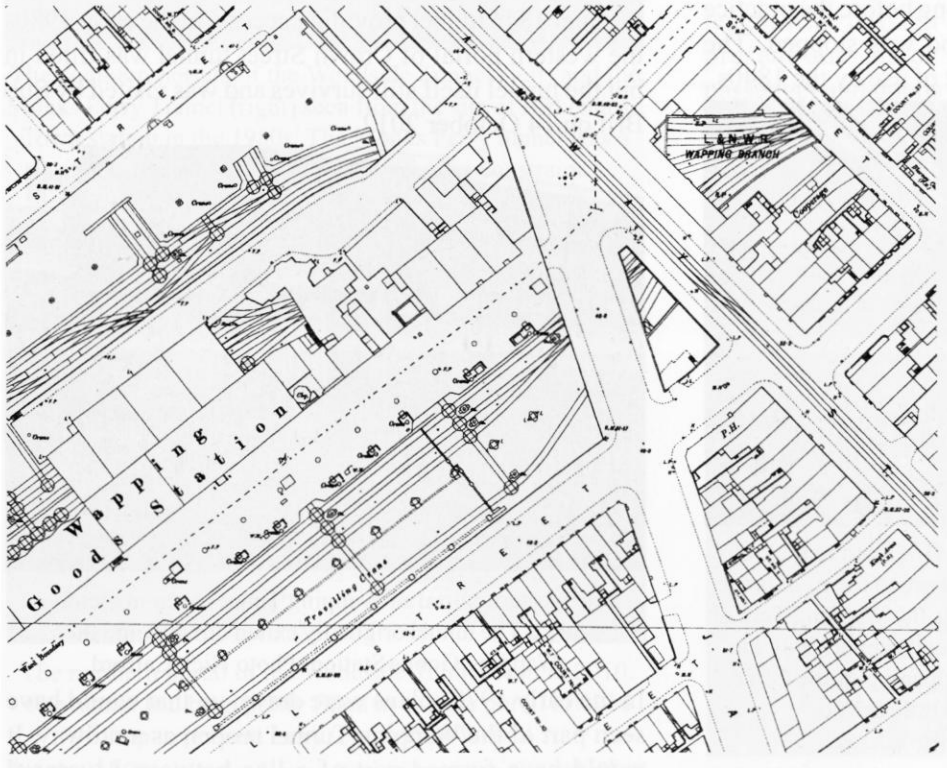
Looking west at the eastern portal of the Wapping Tunnel in the 1950s. The steeply graded line to Wapping Dock is seen leading into the tunnel. To the right is the original Crown Street Tunnel of 1829 and to the left the 1840s tunnel that enabled locomotive working to the site of the original Liverpool and Manchester Railway terminus. Crown Street became a goods station after 1836 and remained in use until 1972.



The western portal of the Crown Street Tunnel seen in the early 1970s. The photograph shows only too clearly the limited clearance of this tunnel. It was for that reason that another tunnel was built between the Edge Hill cutting and Crown Street in the 1840s. Careful observation reveals that some of the original stonework had been removed to allow larger wagons to run through the tunnel. An act of vandalism to such an important and historical industrial artefact but perhaps a small sin compared to the infilling that took place a few years later.

The line through the tunnel was at a falling gradient from Crown Street to the Edge Hill cutting. Passenger coaches travelled from the station at Crown Street to Edge Hill cutting by gravity. Travelling in the opposite direction they were hauled up by a rope that was worked by a stationary steam engine.

Crown Street was not the western limit of the L&M; it continued westwards to Wapping Dock on the Liverpool waterfront. At Wapping a large goods station was provided which was convenient for the dock system at that time. The Wapping Tunnel provided the link between the Edge Hill cutting and the goods station. Wapping was a double-track tunnel of 2240 yards. It was 22 feet wide and had a height of 16 feet; its deepest point was at Hope Street where the tunnel was 70 feet below ground. There was nothing comparable in the world at that time.

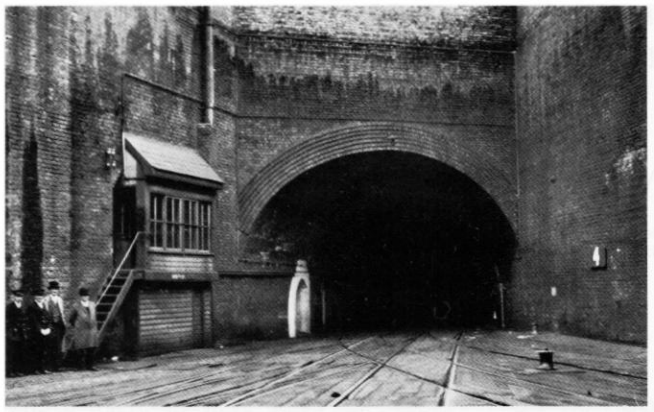


Wapping Goods Station shown on a 1:500 OS Town Plan from 1898 after the western end of Wapping tunnel had been opened out. The original tunnel's western portal is adjacent to the building marked Wapping Goods Station. The two 'new' tunnels can be seen to the north and to the south of the original. The goods station had been enlarged several times since it had opened in 1830. The original building is still present however and is shown to the left of the plan

Work on Wapping started in 1827 and was not without its difficulties. Like Crown Street, Wapping was engineered by George Stephenson using a survey that had been carried out by T L Gooch. Gooch had made errors with the survey and the engineer who was allocated to its construction, Charles Vignoles, did not spot them. Houses at Great George Street became undermined by the works and work had to stop.

Another one of George Stephenson's engineers, Joseph Locke, prepared a report which outlined the issues and made recommendations as to how the errors could be corrected. Vignoles resigned and Locke was given the task of completing the tunnel. He sank side shafts and made alterations and the errors were corrected.

The Wapping tunnel has gradients of 1 in 38 and 1 in 48 and like the Crown Street tunnel was also cable-worked. It was also painted



Alterations were made to Wapping Tunnel in 1896 to facilitate locomotive working. The alterations included the installation of ventilation shafts and the opening out of the tunnel just to the east of Wapping Goods (by then Park Lane Goods). A new western portal was created and it is seen in this view looking east in the 1930s. A signal box was also opened at this location at the same time as the alterations. Two new tunnels, to the rear of the photographer, were created which made working the Park Lane Goods depot easier. Because horses were extensively used in the goods station wooden planking was laid up to rail level.

white and gas lit. The Wapping tunnel was complete by July 1829 when an opening ceremony was held which included a trip through the tunnel for the Mayor of Liverpool in wagons.

In the early years pedestrians were allowed to walk through the tunnel, but it was not long before the practice was considered too dangerous and was stopped. The gas lighting had probably gone out of use by the 1840s.

The three tunnel portals in the Edge Hill Cutting looking west in October 2012. The smallest bore to the right is the 1829 Crown Street Tunnel. Left of it is the Wapping Tunnel and left of that the 1840s Crown Street Tunnel. Only the latter is still in use but since the re-opening of the Olive Mount Chord in 2009 it sees little traffic.
Photo Nick Catford

Within only a couple of years the Crown Street terminus was inadequate for the levels of traffic that it was handling, and it was replaced by a new city-centre terminus at Lime Street on 15 August 1836. The new terminus was also reached by a cable-worked tunnel. Crown Street became a goods station and in 1848 a double-track tunnel was built from Edge Hill cutting to Crown Street that could take locomotives. The original tunnel continued to be used but horse power was substituted for the cables.

Wapping tunnel remained cable-worked until 11 May 1896; after that date locomotives were used. To allow locomotives to work the tunnel safely, ventilation shafts had to be provided. Five shafts were sunk at Crown Street, Myrtle Street, Blackburne Place, Rathbone Street and White Street. At the Wapping end the tunnel was opened out in part and two short additional tunnels were dug that ran into the expanded goods station.

The working of the Wapping tunnel was interesting. The down line (Edge Hill to Wapping) was worked using gravity. Wagons with a brake van at each end rolled down to Wapping Goods, the brake vans being used to control the speed. Locomotives hauled wagons along the up line (from Wapping to Edge Hill). The locomotives travelled from Edge Hill to Wapping using only the up-line which in effect was an up- and down-line as far as locomotives were concerned.

Despite the air shafts, locomotive crews working the Wapping tunnel often described it as a choking experience. Wapping Goods station was closed in 1964 and the tunnel went out of use. The track was lifted shortly after closure.

The original Crown Street tunnel had probably gone out of use by the early 1960s but the yard survived until 1972, the later 1846 tunnel providing access. In the early 1980s the western portal of Crown Street tunnel was filled in but the tunnel itself still survives and was visited by Sub Brit on 14 October 2012.

The western portal of Wapping Tunnel seen in October 2012. The tunnel originally exited directly into the Wapping Goods Station. Photo Nick Catford

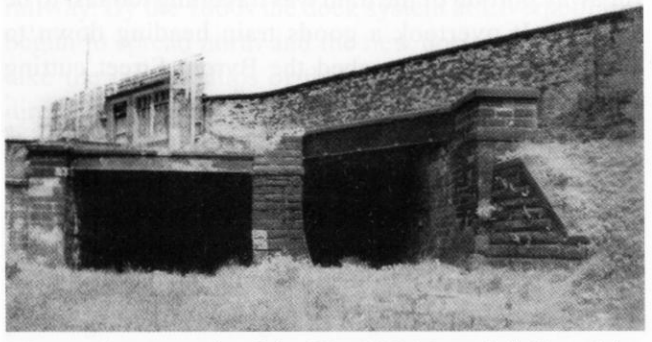
In the early 1970s plans were drawn up that would have seen part of the Wapping Tunnel reopen as a railway. It would have formed part of a line between Liverpool Central low level and Edge Hill. New sections of tunnel would have linked into it at both its eastern and western ends. Part of the link tunnel at the western end was constructed from Liverpool Central but it never reached Wapping. The scheme was dropped during the recession

of the late 1970s/early 80s but every so often it is reconsidered, most recently in 2009.

Currently Wapping Tunnel belongs to Liverpool City Council but very few people ever get to see it. Part of it towards the Wapping end is flooded. The tunnel is a significant piece of industrial archaeology and is deserving of recognition as the world's first main-line railway tunnel. During the October 2012 visit parts of the original gas lighting system could still be seen.

The Birkenhead Joint Railway – Monks Ferry and Woodside Tunnels

The Birkenhead and Chester Railway (B&CR) opened its line from Chester to a temporary station at Birkenhead Grange Lane on 23 September 1840. The aim of the company was to have a riverside terminus from which ferries could provide a connection to Liverpool. To reach the west bank of the River Mersey a tunnel was required. A single-track tunnel of 371 yards was built and Monks Ferry station opened on 23 October 1844.



The southern portals of the Woodside Tunnel (left) and the Monks Ferry Tunnel (right) seen from the site of Birkenhead Town station in the 1980s. The Monks Ferry tunnel was a single-track bore that quickly became a constraint. The Woodside was built as a double-track tunnel.

The northern portal of the Woodside Tunnel seen in 2010. The tunnel had been partly filled in and the portal bricked up to prevent entry. Photo Paul Wright

By the 1870s Monks Ferry station was far too small to deal with the levels of traffic that were using the line which by then had become a joint concern of the Great Western Railway (GWR) and the London & North Western Railway (LNWR). The solution was to build a station at Birkenhead Woodside. The new station opened on 31 March 1878 and it also required a tunnel. The Woodside tunnel was double-track and 565 yards long.

With the opening of Woodside, the station at Monks Ferry became a coal depot and remained in use until the early 1960s. It was completely out of use by 1965 although the track remained in situ.

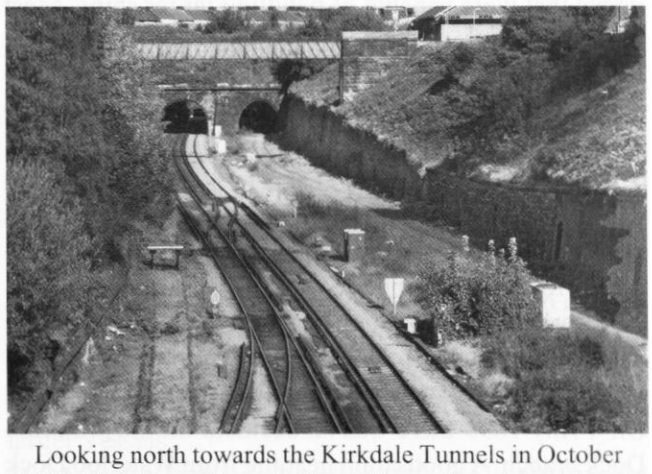
Woodside tunnel carried heavy traffic until Birkenhead Woodside station closed in November 1967. The track was lifted shortly after closure. The eastern end of Monks Ferry tunnel was infilled during the 1970s and railings erected across its western portal. At Birkenhead Woodside the northern portal of the tunnel is bricked up and partly infilled, whilst at its southern end it is partly infilled and has railings to prevent access.

The Lancashire & Yorkshire Railway – Kirkdale Tunnels

On 20 November 1848 the East Lancashire Railway (ELR) and the Lancashire & Yorkshire Railway (LYR) opened lines to Liverpool Great Howard Street (extended to Tithebarn Street in 1850). The ELR line connected Liverpool to Wigan and Bury whilst the LYR route gave a direct route to Preston. The two companies had agreed to use the same alignment between Walton and Liverpool in order to save costs as there was considerable engineering required at that point, not least of which was Breeze Hill.

To overcome the obstacle a tunnel was required. The ELR/LYR built a double-track tunnel of 1,149 yards in length. Cut through dry sandstone, the tunnel did not present any major difficulties and it was used by passenger and goods services of both companies. On 14 June 1855 the LYR absorbed the ELR.

By the early twentieth century – by which time the LYR's Liverpool terminus was Exchange station – traffic on the LYR lines was extremely heavy and the line between Walton and Liverpool was something of a bottleneck. The solution was to quadruple the line.



Looking north towards the Kirkdale Tunnels in October 2012. The disused bore to the right was the original tunnel and it had extended to the point where the grey steel cabinets can be seen next to the railway line. The 1904 bores seen to the left are used by the Merseyrail Northern Line to Ormskirk and to Kirby. Photo Paul Wright

Kirkdale Tunnel was opened out at its southern end and at a point about one-third of the way along its length from the southern portal. This effectively created two tunnels which were renamed as Kirkdale 1 (northern section) and number 2 (southern end). Kirkdale number 1 tunnel was 498 yards long and number 2 was 2010 yards. Two new tunnels were built parallel to the originals on their western side thereby creating a four-track line. The works were all complete by April 1904.

On 3 December 1906 electric trains began to use the new bores, the line having been electrified with live rails. All of the tunnels at Kirkdale remained in use until 29 April 1977. On that day the very last passenger train passed through the 1848 tunnels, a special service that departed Liverpool Exchange at 23.35 and ran to Liverpool Lime Street via Wigan. The train was run to mark the closure of Liverpool Exchange.

In 1972 work had begun on an underground loop and link line in Liverpool as part of the creation of the Merseyrail system. The first sections of the new underground lines opened on 3 May 1977. As part of the works the line from Walton to Kirkby (the original ELR route) was electrified. The junction was moved from Kirkdale (south end of the tunnels) to Walton (north end) which reverted the line between Walton and Kirkdale back to double-track. The western 1904 bores were chosen as the tunnels that would continue in use and the 1848 bores became redundant.

Being part of an intensively worked operational railway, the Kirkdale tunnels are not accessible but they are easily viewed from passing trains that run between Liverpool and Ormskirk and between Liverpool and Kirkby.

The London & North Western Railway – Waterloo & Victoria and Canada Dock Tunnels

The LNWR was the successor to the L&M and it opened a branch from Edge Hill to Waterloo Dock on 1 August 1849. The branch was opened to give access to new docks that were capable of handling larger ships. Most of the branch was in two tunnels, the Waterloo tunnel at 852 yards long and the Victoria Tunnel which is 2706 yards. The tunnels are separated by a deep cutting of 70 yards at Byrom Street.

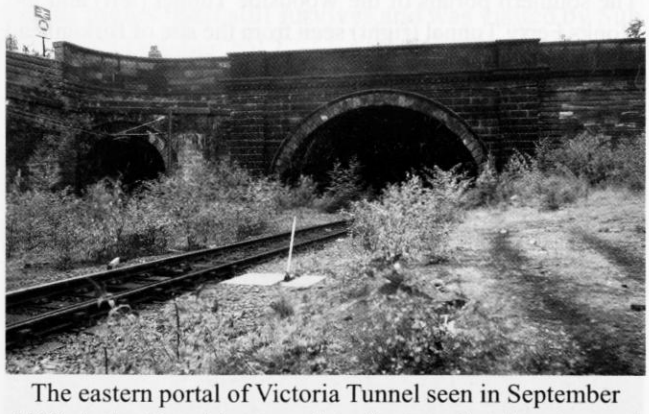
The line was steeply graded at 1 in 56 and 1 in 60 and was cable-worked. New stationary engines were built at Edge Hill to work the cables. In February 1895 the cable broke and locomotive working was introduced. On 12 June 1895 passenger services began to use the Waterloo branch to access a new passenger station adjacent to an ocean liner terminal at Liverpool Riverside.

On 4 July 1899 there was an accident on the Waterloo Dock branch. A goods train heading from Waterloo Dock to Edge Hill became split when a coupling broke whilst in the Victoria Tunnel. Twenty-three loaded wagons and a brake van rolled back towards Waterloo Dock and by the time the guard had realised what had happened, the

The eastern end of the Victoria tunnel opens into a 100 yard cutting, four tracks wide between Byrom Street and Fontenoy Street, which connects to the Victoria Tunnel which is seen in the distance. By March 2012 the cutting had been used as a linear rubbish dump for many years.
Photo Paul Wright

runaway portion of the train was travelling too fast to be stopped. It overtook a goods train heading down to Waterloo and then reached the Byrom Street cutting where there was a set of catch points.

The runaway wagons and brake van were thrown off the rails and smashed into the cutting wall killing two men and badly injuring a third. The quick reaction of the crew on the Waterloo-bound goods in bringing their train to a stop prevented it from ploughing into the wagons of the runaway train.



The eastern portal of Victoria Tunnel seen in September 1998. A short headshunt ran into the tunnel at that time and remains in situ in 2013 but it is little used. The tunnel to the left dates from the 1880s and was constructed as part of the widening and opening out of the 1836 Lime Street tunnel.
Photo Nick Catford

Waterloo Goods station closed on 30 September 1963 but passenger services from Liverpool Riverside continued to pass through the Waterloo and Victoria tunnels until 25 February 1971. The Waterloo Dock branch had closed completely by December 1973. The Victoria and Waterloo tunnels can still be seen. Although the cutting at the western end has been filled-in, the portal is visible. At the eastern end a short length of operational railway still runs into the Waterloo tunnel.

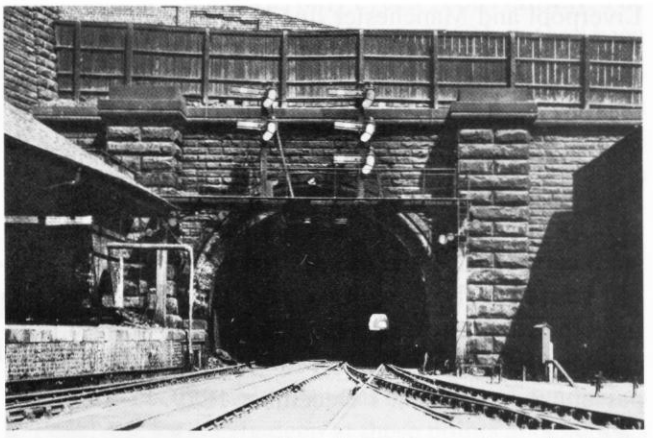
Inside the Victoria Tunnel in 1998. Although the bore was larger than the Wapping tunnel it was still cable worked until 1895.

Canada Dock station was the northern terminus of the LNWR Bootle branch which connected the north Liverpool docks with the Liverpool and Manchester railway. By the 1860s the dock system at Liverpool had begun to spread north and the new docks were able to take the largest ships of the day. The LNWR wanted direct access to the dock system and obtained an Act to build the Bootle Branch railway which opened to Canada Dock for goods services on 15 October 1866.

The branch had three tunnels, the one at the western end being dubbed Canada Dock which was a brick-lined double-track tunnel of 427 yards. On 1 July 1870 passenger services began to run to Canada Dock.

Looking west at Atlantic Dock Junction in 1983. The east portal of Canada Dock tunnel is seen straight ahead. The line to Canada Dock had closed on 12 September 1982 and the junction was in the process of being removed. To the right can be seen the portal of Oriel Road Tunnel which is still in use seeing very heavy freight traffic between the Liverpool Docks and Edge Hill. The base of the Atlantic Dock Junction signal box is also seen in the view. Photo Mike Turner

On 5 September 1881 a line opened from the Bootle branch to Alexandra Dock. It had its junction with the main line just to the east of Canada Dock tunnel at what became Atlantic Dock Junction.



The western portal of Canada Dock tunnel seen in the 1930s. The Canada Dock Goods Station had extended to use every available bit of space and that is why the points extended into the tunnel. At the far end of the tunnel is Atlantic Dock Junction. Photo D Ibbottson

Although mostly used by goods trains, Canada Dock tunnel saw passenger train use until 4 May 1941 when extensive bomb damage closed the station at Canada Dock. Although repairs were quickly carried out to allow goods trains to run, the passenger service was not reintroduced.

Canada Dock goods station closed on 12 September 1982 and the tunnel went out of use. To the east of the tunnel the line remained open serving Alexandra Dock. The western bore of the tunnel was filled in during the 1990s and the tunnel can now only be seen from the site of Atlantic Dock Junction. As only freight trains use the line it is not possible to view the east portal of Canada Dock tunnel. It was observed from a rail tour on 14 April 2012 partially obscured by trees.

Cheshire Lines Railway – Thomas Lane and Sandon & Canada Dock Goods branch Tunnel

The Thomas Lane tunnel was located on the Cheshire Lines Committee Railway (CLC) North Liverpool Extension Line that connected the CLC Liverpool and Manchester line at Halewood to Aintree and, via a branch line, to the north Liverpool docks at Huskisson Dock.

The CLC was a joint railway with three partners: the Great Northern Railway (GNR), the Manchester, Sheffield & Lincolnshire Railway (MS&LR) and the Midland Railway (MR). All had wanted access to Liverpool which by the mid-nineteenth century had become a major seaport.

The CLC Liverpool and Manchester line which opened on 1 August 1873 had given the three companies access to Liverpool but only to the south docks. To the north of the city, new docks had been built that could take much larger vessels.

The London & North Western Railway (LNWR) and the Lancashire & Yorkshire Railway (LYR) had access to the north docks and the CLC partners wanted the same. The most logical way for the CLC to gain such access would have been for them to extend their

Liverpool and Manchester line by three miles from its Liverpool terminus. However this would have involved tunnelling under the city centre which would have been prohibitively expensive.

The alternative solution was to build a line around the eastern edge of the city using agricultural land that was still by the 1870s very cheap. The only significant engineering that would be required was at Walton, north of Liverpool. The North Liverpool Extension Line and its branch to Huskisson was authorised on 30 July 1874 and opened from Halewood to Walton-on-the-Hill for passenger services on 1 December 1879.

Thomas Lane Tunnel looking north in December 2012. The bore to the left was never used. It was built to facilitate a future quadrupling that never happened. The Liverpool Loop Line path which is part of the Trans-Pennine Trail cycleway runs through the eastern bore which carried the two tracks of the CLC North Liverpool Extension Line. Photo Paul Wright

A tunnel was required at Thomas Lane to carry the line under a crossroads. An interesting feature of the double-track North Liverpool Extension Line was that the infrastructure was laid out in a way that would make quadrupling the line at a future date an easy task.

Bridges were built with double arches capable of taking two tracks through each. The cuttings and embankments were only made to accommodate two tracks although enough land was purchased to allow for widening. Two parallel tunnels were built at Thomas Lane but only the east bore was brought into use – the west bore would never be used.

The line went on to become a major freight artery to the Liverpool docks and from 1884 an extension was opened to Southport. It went into decline in the second half of the twentieth century and the Thomas Lane tunnel saw its last regular passenger trains on 5 November 1960 (although excursions ran for a period after that date). On 21 October 1972 the line through the tunnel was singled. The last freight trains ran in May 1975 and the line was taken out of use in August 1975. The track was lifted in the early months of 1979. In the late 1980s the Liverpool Loop Line path (part of the Trans-Pennine Trail) opened through the tunnel.

The Huskisson goods station was opened by the CLC on 1 July 1880. Huskisson goods station was located on the east side of the LYR line from Liverpool to Preston. The Liverpool dock system – which was the primary reason why the CLC opened a line to Huskisson – was on the west side. In addition the MR had a goods station of its own on the west side of the LYR line called Sandon & Canada Dock Goods.

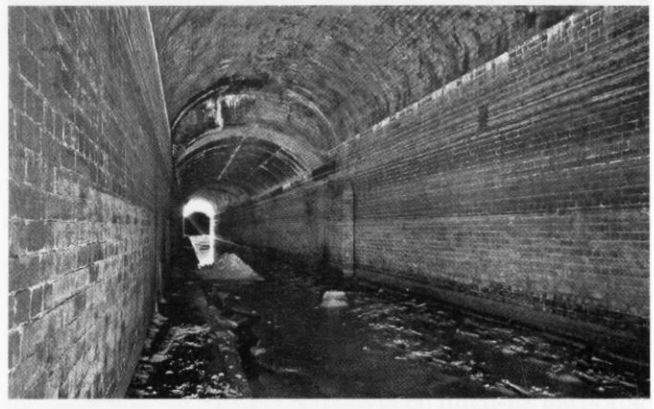
The east portal of the tunnel that carried the Sandon & Canada branch under the former LYR Liverpool & Preston line seen in January 2013. The branch started from a point within the Huskisson Goods Station and ran to the MR Sandon & Canada Dock Goods Station. Photo Paul Wright

A connection from Huskisson to Sandon & Canada Dock and onwards to the docks was essential. The solution was to build a branch from Huskisson to Sandon & Canada. As the CLC line was at a much lower elevation than the LYR, a tunnel was required to allow the branch to pass under the Liverpool and Preston line.

The branch opened on 1 November 1882 and remained in use until closed by British Railways on 24 February 1969. In January 2013 the west portal was found to be completely bricked up; the east portal had also been bricked up but had been provided with a steel door.

The Midland Railway's Bootle Tunnel

As previously mentioned, the MR was a partner in the CLC through which it had access to the Liverpool dock system. By the 1880s the MR wanted a large depot of its own in the rapidly expanding north docks. To achieve this they opened on 1 June 1885 a two-mile 330-yards branch from Fazakerley North Junction (on the North Liverpool Extension line) to a goods station at Langton Dock.



Looking west along the down line bore of the Bootle tunnel in July 2012. The tunnel appears to be in very good condition despite being out of use for over 40 years

The branch required a tunnel at Bootle to carry it under the Leeds & Liverpool Canal and Marsh Lane. For nearly its entire length the tunnel was directly under Marsh Lane. The tunnel was constructed using the cut-and-cover method and consisted of two parallel single-track bores constructed from brick. The tunnel was 481 yards long and had an opening at its mid-point which provided ventilation.

The Langton branch was only ever a goods railway. The branch officially closed on 1 January 1969 but it had been out of use since at least September 1968. In the 1980s the western portal of Bootle Tunnel was filled in. The cutting at the east end was likewise filled in but a small section by the east portal was left unfilled to provide access to the tunnel.

Ceaucescu's Bunker, Bucharest

Julian Allason

Any Balkan adventure could usefully begin in Bucharest, unexpectedly appealing in a melancholy way with its crumbling Romanian Neo-Classical buildings. The Gallic inspiration for what was once celebrated as Little Paris is evident in broad boulevards radiating from Place Charles de Gaulle, "called after the great French revolutionary," asserted our guide, Monika, an attribution that might have surprised the conservative general.

It was originally named in honour of a brigand; renamed Hitler Square in 1940; and hurriedly redubbed Stalin Square after Bucharest's "liberation" by the Red Army. Just off it is the tranquil outdoor Village Museum where traditional houses from Transylvania – complete with anti-vampire features – and other regions have been reassembled beside a lake. Chickens scratch the dirt, the property of peasants periodically imported to lend authenticity.

Ceaucescu's folly

The capital's improbable highlight is the thousand-room Palace of the People, erected by the communist dictator Nicolae Ceaucescu at a cost that reduced his country to penury. Only the Pentagon in Washington DC is reckoned larger. Indeed, after appropriate subventions had been made, the presenters of *Top Gear* contrived to run a motor race through a 4km circuit of its basement and secret escape tunnels. Used by the Romanian parliament, the Palace still shelters mysteries, including the precise location of Ceaucescu's bunker.

Ceaucescu's bunker is supposed to be located somewhere beneath this building

Diplomatic nosiness during construction supported by satellite imagery (by no means as highly developed in the late 1980s as now) is believed to have narrowed its position to two possible positions on the site. Foundations seemed unnecessarily deep at these points and analysts believed there were indications of an artesian well having been sunk and a concentration of infrastructure. The location judged most likely abutted a tunnel to the defence ministry (also supposed to have its own bunker) that remains in official but private use.

With advance booking through a hotel concierge or local travel agency, it is possible to reserve a place on a group tour of the Palace. Photography is not permitted, and visitors are subjected to airport-style security. The cameras and phones of infractors may be confiscated. The tour involves 300 steps and takes approximately one hour.

No tunnel vision

Good English is spoken by the young guides who are surprisingly forthcoming about every subject other than the bunker and tunnels. Even allowing for service facilities and storage areas, there is still a surprising amount of subterranean space on two levels that appears unaccounted for. Lifts, not available to visitors, appear to descend to both these levels. Although air-conditioning was not included in the original construction (some offices have had individual units retrofitted), vents and ducting have been noted at the levels below the ground floor.

If the palace's marbled interior is of the soulless opulence to which Iron Curtain public architecture aspired, standing on the balcony from which the self-styled Colossus of the Carpathians and his illiterate wife harangued the populace still sends a shiver down the spine a quarter of a century on. Will his bunker ever be used?

It seems unlikely but the Romanian government is said to have decommissioned few of its inherited installations in the capital. Hence local conviction that the bunker remains on a care-and-maintenance basis. That said, its Soviet-supplied communications equipment would now be at least a quarter of a century old and the networks to which they linked largely gone.

No comprehensive map of the Palace is available and at this point further investigation is unlikely to be possible as tight security is maintained in what is, after all, the country's legislature. There also remains some residual suspicion of "foreign spies and terrorists". However it may be that the technical expertise of SubBrit members can deduce more from publicly available imagery.

Poster Art 150 London Underground's Greatest Designs

Stewart Wild

Running from 15 February until 27 October this year, as part of the Tube's 150th anniversary celebrations, the London Transport Museum in Covent Garden has a splendid exhibition of 150 of the Underground's best posters, covering a period of over a century. I went to take a look.

Selected by an illustrious panel of eight art and design experts and historians, 150 of the best designs have been plucked from the 3,300 Underground posters held in the archives at the LT Depot at Acton. Few people realise that the Museum holds one of the world's finest and most comprehensive collections of transport posters and art, currently totalling over 7,000 items.

Brightly displayed in the Museum's small two-level gallery under the Victorian building's iron roof supports, the 150 framed posters are grouped into six themes:

- Away from It All
- Brightest London
- Capital Culture
- Finding Your Way
- Keeps London Going
- Love Your City

The collection really is fascinating. The earliest is a large poster from 1886 comparing fares on the District Railway as it tried to compete with the Metropolitan Railway, and from then on there's a ride through London's social transport history: Underground etiquette; the introduction of escalators and automatic sliding doors; expansion out to the capital's leafy suburbs; common-sense advice in wartime; through services with surface rail to seaside resorts; and speedy access to the capital's major sporting events at Wembley and Wimbledon.

A wide range of sporting events from the 1930s is featured in a series of smaller-size posters suitable for display inside Tube carriages. One early poster features a catchy rhyme for which a 14-year-old schoolboy won first prize in a slogan competition:

Underground to Anywhere
Quickest Way, Cheapest Fare

Many posters offer rather more subtle messages: for example, one from 1913 designed to attract more female customers features a smart young lady about to take the Tube; the poster colours are predominantly green, white and purple, the colours used by the growing suffragette movement.

The largest poster in the exhibition is one of my favourites, dating from 1926. Measuring 50 by 40 inches, it is the work of well-known poster artist and illustrator Montague Birrell Black (1889-1964) and features a look into the future entitled "London 2026 A.D."

A stylised view of the capital in 2026, "This is All in the Air" is contrasted with "Today – the solid Comfort of the Underground". What is so remarkable is that this imaginary view of future London from nearly a century ago features so much that is now familiar: very tall buildings and office blocks, one looking like Canary Wharf; small aircraft flying over the city; and speedy air services from London to New York and Sydney. One of these futuristic posters from the Museum's duplicate collection sold for over £4,000 at a Christie's auction sale in London last October.

Of course, Harry Beck's famous map of the Underground introduced in 1933 is featured, alongside other designs by well-known personalities ranging from Mabel Lucie Attwell to Man Ray and Cyril Bird, a prolific illustrator whose pen name was Fougasse.

Fougasse was a clever cartoonist who used humour to get across an idea or message, and became famous as the creator of a series of wartime propaganda posters including *Careless Talk Costs Lives*. A former editor of *Punch* magazine, he died in 1965, having contributed many posters to the Underground and also for Imperial Airways.

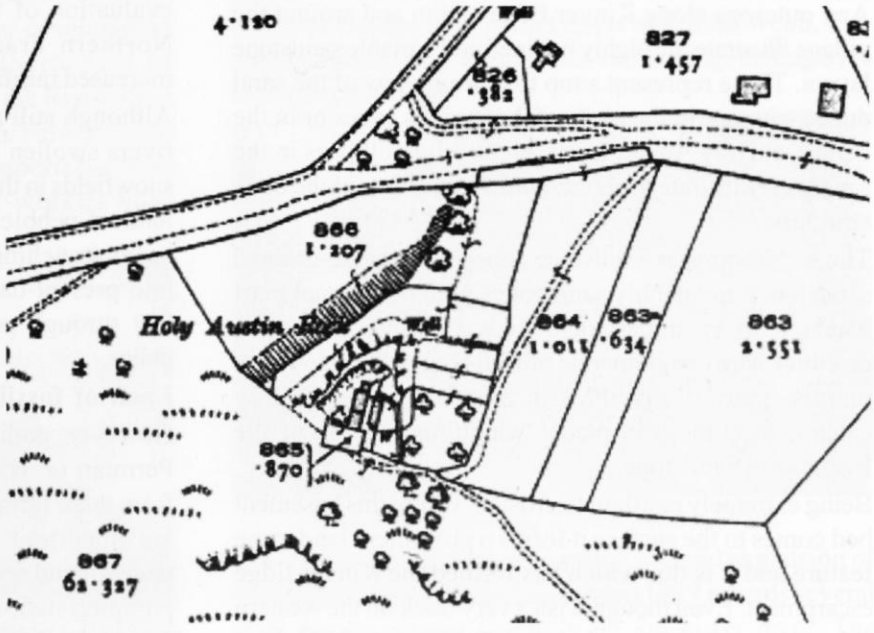
Masterpieces of art and design, many of the selected posters use the Underground's special typeface known as Johnston Sans (or its later derivations), created by Edward Johnston (1872-1944). Prior to World War I he was commissioned by Frank Pick to create a new typeface to strengthen the Underground's corporate identity.

Frank Pick (1878-1941) was Commercial Manager of the Underground, having joined the group in 1906. He went on to become a major influence on London's transport, introducing the famous roundel and commissioning distinctive new station architecture, and held a variety of senior management positions until he retired in 1940. He was responsible for many innovations, including the use of poster art to promote a strong marketing message.

Featuring practical advice on travel and etiquette as well as advertising Tube services and encouraging subterranean travel, the featured posters not only show how the Underground has kept London on the move, but also the organisation's pioneering role as a great patron of poster art.

Holy Austin Rock Houses at Kinver Edge

Mike Parker



In south Staffordshire, just west of Stourbridge and very close to the border with Worcestershire, lies the little town of Kinver, famous for its rock-cut "cave houses" and ancient underground dwellings. Those known as Holy Austin, now under the guardianship of the National Trust, are unique and were inhabited until the 1950s.

Holy Austin is said to be named after a monk who lived near the site during the sixteenth century and is the earliest known reference to occupation at Holy Austin Rock. However the origin of the rock that the dwellings are cut into goes back much, much further.

The geology of Kinver is the most important feature that encapsulates and underpins the village's character and conveys its local distinctiveness. The brick red/orange sandstones appear in roadside outcrops on all the approach roads and are also prominent features in and around the village as part of the natural environment as well as being an integral aspect of the social history and heritage.

Ice age erosion

The underlying geology is responsible for the shaping of the landscape which is enhanced or softened by geological processes such as erosion and weathering. The present-day shape of the Kinver landscape including the prominent Kinver Edge is mainly the result of erosion by ice and water during the last ice age. The rocks are also ancient memorials of environments and climate change in the past.

Within the immediate area of the village there are two distinct rock formations present, with the Bridgnorth Sandstone Formation of the late Permian Age (about 260 million years ago) on top.

The sediments making up the two formations were not deposited continuously and it is extremely difficult to convey the vastness of time that the irregular contact junction between two different groups represents. What is also remarkable is that, at the time of deposition, the world's landmass then formed one giant super-continent known as Pangaea, and the part of the earth's crust upon which Kinver now stands once lay at a latitude about 15 degrees north of the equator approximately where Sudan, Chad and other sub-Saharan countries lie today.

The Bridgnorth Sandstone underlies the village and occupies the ground beneath Kinver Edge. It is well exposed in many places such as at Stag Corner, Stone Lane, Holy Austin Rock and Vales Rock. It is bright brick-red in colour and, being relatively soft, can usually be worked with hand tools yet is sufficiently competent to stand in vertical faces. It has been excavated to provide dwellings or storage caverns especially along the canal networks, at Holy Austin Rock itself and at other locations along Kinver Edge including Drakelow. In the past blocks have been cut to be used in buildings and walls although it weathers quite easily as a result of its softness. Elsewhere in the area there were extensive sand quarries serving the building industry.

Sahara-like sand dunes

The sand forming the sandstone has an unusual origin. It is composed of spherical grains of quartz which were shaped by wind action and are loosely cemented with a thin veneer of Iron oxide, a sort of rust which gives it its brick-red colour. The sandstone is sometimes known as Dune Sandstone because the formation was created as an Aeolian (wind) deposit in one of the most arid periods of the distant past.

The Bridgnorth Sandstone is a record of a great Sahara-like desert basin which extended northwards and westwards with huge sand dunes built up by the prevailing

This is believed to be Joseph Fletcher around the turn of the 20th century

east wind blowing off what would have been the Black Country highlands.

Any outcrops along Kinver Edge and in and around the village illustrate the highly inclined and variable sandstone layers. These represent a top to bottom view of the sand dunes whereas in the roofs of the various caves or in the ceiling at Holy Austin Rock, the swirling ellipses in the sandstone illustrate the horizontal or plan view of the dune structure.

The Kidderminster Sandstone consists of coarse-grained sandstones and pebbly sandstones with occasional marl bands. The lowest (basement) beds comprise coarse grits or a thick hard conglomerate of well-rounded water-worn, mainly quartzite, pebbles in a sand matrix, slightly calcareous (limey) in places which rest on top of the Bridgnorth Sandstone.

Being extremely resistant to erosion, where this basement bed comes to the surface it forms a prominent landscape feature and it is this which has formed the Kinver Edge escarpment. Even though it isn't very thick on the western side, it protects the underlying Bridgnorth Sandstone which can then develop quite high cliffs.

The Kidderminster Sandstone is the source of the pebble scree found all along the Edge and seen when walking along the ridge. It can be seen in section in places at the top of Kinver Edge or occasionally in roadside cuttings which cross over the top. Where access is possible it can be seen capping the underlying Bridgnorth sandstone. The junction is an irregular, locally pocketed, eroded surface known as an unconformity because of the time gap between the two formations.

Historically the Kidderminster Formation has been worked for gravel near Kinver although only to a small extent compared with elsewhere. The basement beds are well exposed southeast of the church in Church Hill although the actual base and contact with the Bridgnorth sandstone is not exposed. There are also good exposures of conglomerate and pebbly sandstone on the banks of the canal north and south of Dunsley Hall.

Mrs Bragger and adopted son Eddie in around 1910

The Kidderminster Formation records an environment in marked contrast to the time of the Bridgnorth Sandstone. Some of the pebble quartzites are similar to those that occur at Lockey and Nuneaton suggesting Midlands derivation but many have no Midlands counterparts. Re-evaluation of the mountains in Southern England or Northern France is postulated with consequently increased rainfall.

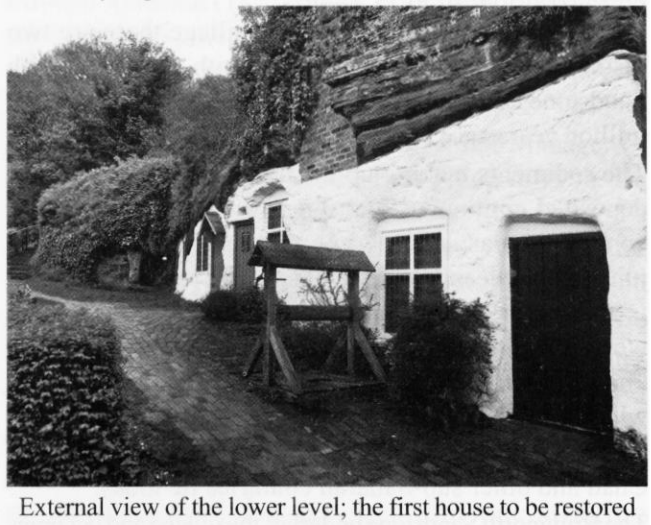
Although still a continuation of arid desert conditions, rivers swollen by seasonal rainfall, or even by melting snowfields in the high distant mountains, would drop their load of pebbles and sand as 'delta fans' in the desert basin stretching from the edges of those mountains up into present-day Cheshire. The water would finally be lost through percolation or evaporation in the desert plains.

Lack of fossils

However, nothing is known of life in this part of the Permian or Triassic deserts as no fossils are recorded from these formations locally. Both geological formations are important sources of water supply being natural underground reservoirs (aquifers) and, traditionally, Kinver pumping station has supplied water locally and even to a wider area beyond.

The glacial history of the district has been little researched and whilst the river Stour has been significantly more powerful and broader than today, it seems likely that ice or a huge outpouring of meltwater may have cut gorges through the escarpment here as well as at a number of other locations. The erosive power can be judged by the enhanced height of the escarpment and the width of the gorge north of the church.

A small stream (named Mill Stream on the OS map) which joins the Stour south of Hyde may indicate the direction of flow from the ice-front. North of the village, the steep-sided Hampton valley is dry today but offers another clue to a watery past when the water table would have been relatively higher.



External view of the lower level; the first house to be restored

It should be pointed out that the land surface in general would have been lower in relation to sea level at this period because of the enormous weight of the ice field. Subsequent rising of the land following the retreat of the ice enabled the Stour to cut through the rocks leaving

separate terrace deposits of sand and gravel at significant distances away from its present-day course.

Sands and gravels originating either as glacial outwash from ice-sheets (which at their maximum development 25,000 years ago reached the northern part of Wolverhampton) or as terrace deposits of the River Stour during interglacial periods (warm periods between cold phases) have been of major economic importance with the deposits at the Stewponey being worked until comparatively recently.

The upper floor of the first house to be restored. The tea room is here

Prehistoric animals

What may seem an exotic fauna adapted to life on the tundra included mammoth, woolly rhinoceros, musk ox, horse and reindeer which have been recorded from the district. During the warmer interglacial periods, species familiar in an African setting today such as hippopotamus, elephant and bison are recorded from Stourbridge.

It is not known when Holy Austin Rock first became populated; an Iron Age tribe built a hill fort on the summit some 2,500 years ago and it is speculated that the outcrop could have provided shelter even in those times.

The first written reference to rock-cut houses at Kinver is from the book *The Beauties of Enville* by J Heely. The author describes walking from Hagley to Enville in 1777, when a violent storm broke out as he crossed Kinver Edge.

Looking for shelter and seeing smoke, he descended to find what he describes as a clean and decent family living there. He also described the rooms there as 'curiously warm and commodious, and the garden as 'extremely pretty' lying on a shelf of the rock towards the south and full of every necessary. After leaving once the storm had eased, Heely's conclusion was that even in 1777, Holy Austin was a curious place but well worth visiting.

Family gathering

There is no further documentary evidence of the rock houses after Heely's book until some sixty years later in *Bright's Survey* (arguably the predecessor of the modern property rating and valuation surveys). It identified a plot of land at Holy Austin which was occupied by six cottages and gardens. The occupants were listed as: Thomas Childs, Benjamin Williams, Sarah Brookes, Lucretia Penzer, Benjamin Glover and John Webb. The same surnames appear in lists of residents spreading over several generations.

Probably one of the Reeves family c1930s

The nineteenth century was a time of rapid expansion of occupation, and a deed of sale dated 1829 records several rock houses almost certainly on the lower level. The numbers living there continued to rise and by 1861 there were eleven families, forty-six persons in all, living at Holy Austin. The increase was due to the growing demand for labour in the expanding iron industry in Kinver along the Staffordshire and Worcestershire canal that had opened in 1772.

A century later saw the iron industry declining to eventual cessation around the 1880s. As a direct consequence population numbers fell and by 1891 only four families were living at Holy Austin.

Censuses also record other occupations at Holy Austin; farm labouring, besom making, mole catching and taking in laundry are typical examples. The longest resident family of Holy Austin was the Shaw family who lived there until 1935 – over 150 years after the family had first moved in.

The rock houses were as comfortable as other houses of the time and the families apparently enjoyed living there. These homes were warm in the winter and cool in the summer and they were for the most part dry.

Gas and water on tap

Water was drawn from two deep wells – one for the upper level and one for the lower level. When the pumping station was opened in the village in the 1930s both wells dried up and the water company provided an outside tap. Also, around this time, town gas was installed – the remains of the pipework can still be seen running alongside the paths.

Tourism increased dramatically in the early part of the twentieth century, and tens of thousands of visitors from the Black Country travelled by tram to sample the fresh air of Kinver Edge and the woodlands. Residents of the rock houses were quick off the mark in supplementing their income by selling teas and light refreshments.

Recently restored house where the Reeves family lived in the 1930s

By the end of the second world war only two families remained; one occupying the three gabled upper levels, the other the whole of the lower caves. Occupation of the lower caves ceased in the 1950s but the café continued trading until 1967. The upper level remained occupied, despite the collapse of the one end gable in 1963.

Holy Austin and Kinver Edge, with the exception of the upper level, were purchased by the Grovenor Lee family in memory of their parents and then gifted to the National Trust in 1917. The upper level was later purchased in 1964 for the sum of £113.19s.

After the closure of the café in 1967 the site suffered serious decline. Weather and vandalism caused rapid decay and there were several rock collapses. For public safety, the upper gabled dwelling along with other dangerous features had to be pulled down; however the lower caves were bricked up and remained largely unaffected.

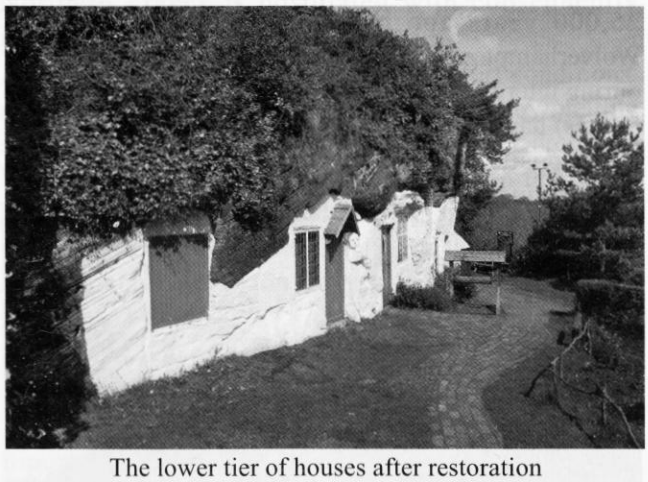
SSSI protection and National Trust rescue

Holy Austin is a designated Site of Special Scientific Interest; in addition to its geology, the rock dwellings also merit particular protection and for many years various ideas were considered to protect the site from the ravages of time. The solution was both ambitious and unique.

A scheme put forward by the National Trust involved the reconstruction of the upper gabled dwelling. The Trust was supported in this by the Kinver Edge Local Management Committee (which changed its name in 1993 to the Kinver Edge Committee). A local architect was engaged to prepare plans to that effect.

A tourist attraction for over a hundred years, Holy Austin had generated a vast photographic archive, mainly postcards. A good written record also existed, as well as the recollections of those who had once lived there. The first stage of the project was completed in 1993, and the upper gables then formed the private residence of the site Custodian.

Success of this first phase had been such that a group of volunteers were formed to support the work of the National Trust. Their tasks were many but the first was to clear thirty years of scrub from the original gardens and re-establish them as productive allotments. An old orchard was also identified and replanted.



The lower tier of houses after restoration

Improved access

A route to the lower caves was built for the less able with over 150 tonnes of stone being moved, much of it by hand, during its construction around the rocky outcrop. In 1995 a new well head was erected over the lower caves' well shaft and paths laid in the original brick paving style.

The second phase to restore the lower caves was undertaken in 1997. After thirty years the bricked-up dwellings were opened once more. The first objective was to secure and stabilise the rock in the main cave, which had suffered severe damage from roots above. A brick vault was constructed, reinforced with stainless steel rods, with concrete filling the void above.

Rock bolts were inserted to secure the rock frontage to a larger mass behind. Doors and leaded-light windows were installed, as was the black lead fireplace in the parlour. The exterior and much of the interior was limewashed in the traditional manner to protect and seal the sandstone.

Attention was now turned to the design and installation of an interpretation display. A painting by Alfred Rushton in 1903 of Mr & Mrs Fletcher, sitting at their table in the very dwelling that remained intact, was the principal source of information for the work.

The Kinver Edge volunteers expanded at this stage and formed a group of Lower Cave Volunteers under the guidance of the National Trust Custodian of Holy Austin Rock Houses. The volunteers worked very hard in a very short period of time acquiring much of the furniture and artefacts towards creating an impression of cave life at the turn of the century. In 2004 to prevent any further erosion damage and using old photographs as guidance, the shuttered windows and door in what was once a single house to the west were replaced.

More recently, in 2009, the upper dwelling which had become vacant was converted into Tea Rooms, and visitors to the site are now able to enjoy refreshments, either inside or on the garden terrace.

In the latest phase of development the National Trust has reconstructed the remaining dwelling on the lower lever to reflect the period from the 1930s when the Reeves family was living at this location. The Reeves family moved to Holy Austin from nearby Crows (or) Vales Rock, so at this point there were two generation of Reeves living on the lower level. This dwelling was opened in 2012, and is proving a popular new addition with many visitors coming back for a return visit.

A link with hobbits?

Holy Austin Rock Houses are now a popular attraction in the area, with many visitors coming from abroad to see these unique dwellings. A frequently asked question is 'could these homes have been the inspiration for Tolkien's *Hobbiton*?'

Whilst there is no known reference to his having visited, it seems likely that as a resident of nearby Birmingham and as a professor of Anglo-Saxon history he would almost certain have been aware of them. As a known curiosity the rock houses featured in articles in both local and national newspapers.

The site is currently open to visitors from the beginning of March until the end of November, the houses open from 2pm to 4pm on Thursday and Friday and from 11am to 4pm on Saturday and Sunday. The Tea Rooms open from 11am to 4pm on all four of these days. The post code for the site is DY7 6DL and the NGR is SO836836.

And while you're in the area, it's only a few miles south to Drakelow's remarkable underground tunnel complex, former aircraft factory and RSG, comprehensively featured in *Subterranea* 26 (April 2011).

All recent photographs © The National Trust.

Further information: kinveredge@nationaltrust.org.uk
www.drakelow.info
www.subbrit.org.uk/rsg/sites/d/drakelow/

Underground in Iceland: Þrihnukagigur [Thrihnukagigur]

Paul W. Sowan

Iceland's almost entirely volcanic geology hosts a variety of underground spaces, including natural caves, some of which have been adapted for human purposes;

These include artificially excavated 'caves' rather like some of those in Nottingham and Reigate (albeit in a very different sort of rock); a few small mines for poor-quality coal which seem to have been worked only in times of dire necessity such as World War I; a number of road tunnels including one undersea tunnel connecting the two sides of a long fiord; and a number of tunnels for water associated with hydro-electric power stations.

The 'Iceland spar' mine in one of the east coast fiords was in reality simply an opencast pit, and the 'sulphur mines' at several places such as Krysuvik and Myvatnssveit were only surface diggings in hot ground. The Icelandic word *náma* signifies a place where minerals are worked, either opencast or underground.

The list of natural caves adapted for human use has now been extended by the addition of Þrihnukagigur [Thrihnukagigur] as a white-knuckle-ride tourist attraction, as we'll see later.

Natural caves in Iceland

There is no limestone in Iceland, so no natural solution caves of the kind familiar in Britain in such areas as the Mendip Hills, the Pennines or South Wales.

The Icelandic natural caves have been formed in the post-glacial lava fields by two processes: tectonic movements, and lava thrown out or running out of horizontal or vertical conduits (sometimes known as lava tubes). Earth movements have opened up tension fissures such as the famous Almannagjá (all men's chasm) in the Þingvellir [Thingvellir] area, site of the world's oldest parliament.

Sometimes these are roofed-over by naturally fallen huge slabs of lava. At Jarðbaðshólar [Jardsbadshólar] (earth bathing caves) in the Mývatn district, such caves were long a minor tourist attraction as they contained beautifully warm water in which to bathe, away from inclement weather outside. However, since relatively recent eruptions in the area the temperature of the water here has gone up to 65° Celsius: far too hot for comfort!

Lava tube caves are formed where molten rock continues to flow through underground channels where the lava flow surface has cooled and solidified. If the lava flows out completely, a lava tube cave is left. Amongst the longest is Surtshellir, reputedly used by sheltering outlaws living in the deserts of central Iceland. Sometimes farmers have used small lava caves as shelters for sheep, or somewhere to store potatoes.

Vertical volcanic vents are also sometimes left empty when all the lava has been ejected. Small ones can be explored in the Mývatn area along the Lúdentsborgir and Þrengslaborgir [Threngslaborgir] crater rows. I have descended one or two of these, and found (in midsummer) snow and icicles maybe 30 metres down.

Both lava tubes and vents have 'stalactites' looking like chocolate-coloured dribbles of candle-wax. They are simply blobs of lava which solidified as they trickled down the cave walls. Unlike calcite stalactites in limestone caves, they do not grow continuously by precipitation from mineral-charged groundwater, and will never regrow if broken.

Icelandic volcanoes

If asked to 'draw a volcano', children – and probably most adults – tend to sketch a very steep-sided cone with flames shooting out of the top! They earn nought out of ten! Some volcanoes do indeed build heaps of lava or ash or ejected broken rocks, but the slope angles of the resulting heaps are never as steep as most people seem to imagine.

There are many kinds of volcano, and Iceland has a good representative collection. One type built of nothing but lava

flows over a period of years (as found in Hawaii) has very shallow angled flanks. Skjaldbreiður [Skjaldbreidur] in Iceland is a splendid example of a 'shield volcano' and has a slope angle of under 10°.

People arriving in Reykjavik from Keflavik airport pass, but do not notice, quite a few shallow shield volcanoes from the airport bus. At the other extreme, Iceland also has 'strato-volcanoes' which are seriously big mountains with sometimes (between eruptions) small ice caps on top. Snaefellsjökull, where Jules Verne's imaginary *Journey to the Centre of the Earth* went underground is of this class.

These strato-volcanoes are massive piles of lava and ashes. They may in places be quite steep-sided, if they contain a highly viscous lava such as rhyolite or obsidian (a black natural glass). Another kind of volcano found in Iceland isn't any sort of mountain, or even hill. Massive craters have formed in places such as Askja largely by a big circular tract of land simply subsiding into a former magma chamber from which all the basalt lava has leaked out and flowed away around the edges.

And at Kerið [Kerid] in south Iceland another big circular hole in the ground has formed simply by its contents being blown sky-high by a massive subterranean explosion. Where the rocks and dust come to land depends on the sizes of the particles, and the prevailing wind direction at the time of the eruption. As many will remember, European air traffic was seriously disrupted by Icelandic volcanic ash from an explosive volcano three years ago.

Fissure eruptions and crater rows

Technically amongst the biggest Icelandic volcanoes, but the least visible in the landscape, are the fissure eruptions and their crater rows.

As Iceland lies astride the volcanically and seismically very active Mid-Atlantic Ridge, where the European and North American 'plates' are drifting apart at about half an inch a year, the landscape in a wide zone stretching from the southwest (Keflavik / Reykjavik area) to the northeast is littered with chasms, often several metres or tens of metres wide and kilometres long, known as tension fissures. Some of these remain empty, whilst others form channels through which huge volumes of basalt lava are erupted.

The biggest lava flow on our planet in historically recorded time was the Laki eruption in Iceland in 1783–84. In eight months this fissure volcano erupted several cubic kilometres of molten basalt rock. But as this sort of lava is very fluid (rather like red-hot runny porridge), it never built a mountain. Instead it covered many square kilometre of the surrounding land, as well as filling up a large river valley. The actual site of the eruption as seen today is simply a line, several kilometres long, of quite small lava cones, generally less than 100 metres high.

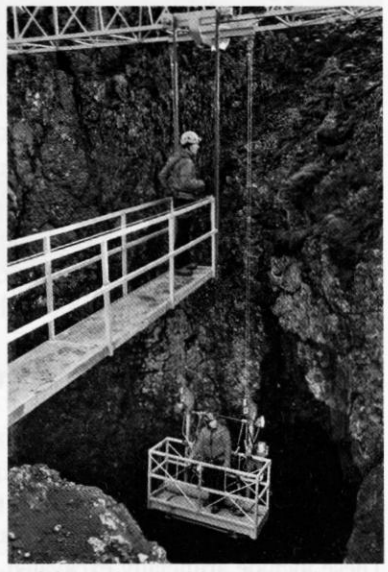
About twenty percent of the population of Iceland died as a result of the Laki eruption, not so much as a direct result of the eruption itself in quite a remote area, but on account of the grazing land, cattle and sheep being poisoned by volcanic gases (including hydrogen fluoride and sulphur dioxide) or buried under lava or volcanic ash. There was mass starvation the next winter.

Þrihnukagigur [Thrihnukagigur]

Thrihnukagigur lies in an area of post-glacial lava flows near Bláfjoll (the Blue Mountains) about 18 kilometres southeast of Reykjavík. The name of this cave means 'three peak cave' and is thus reminiscent of Jules Verne's imaginary voyage to 'the centre of the earth'.

The entrance to the Thrihnukagigur chamber is an irregularly shaped hole about four metres across at the top of a small volcanic cone standing about forty metres above the surrounding lava plain. It is one of a number of such cones along the line of this fissure eruption.

The void widens downwards, and those descending into it land on the top of a pile of fallen rubble around 120 metres down. From that point it is possible to scramble down one side to a maximum depth of about 190 metres. The void is sufficiently large, above the top of the mound of rubble, to accommodate the Statue of Liberty.



Visitors descend into the volcano in a cradle similar to those used by window cleaners on office blocks. Photo Aðalgrímur Sigurbjornsson

A unique underground tourist attraction

A local tour operator has been licensed to offer summer adventure tours five times a day from 15 May to 10 September, giving those with enough courage about 45 minutes literally inside the volcano. Visitors are lowered down vertically on a winch-operated platform, the time taken to reach the bottom being five to eight minutes to allow the features passed on the descent to be examined.

The price is an eye-watering ISK 37,000 (approx £200) but that does include pick-up and drop-off at your hotel in Reykjavik, all necessary safety gear, helmet and harness and a tour guide throughout. Full information and photographs are available at this comprehensive website: **www.insidethevolcano.com**.

As the void has been the route taken by possibly as much as a cubic kilometre of melted rock, the sides of the chamber seem from the photographs to be lined with the solidified remains of the last of the lava that didn't get thrown out on the surface. I imagine lava stalactites will be in evidence. But this feature means it may be difficult or even impossible to appreciate how many lava flows or other rock layers are passed though on the way down. Such stratification doesn't seem to be visible in the photographs.

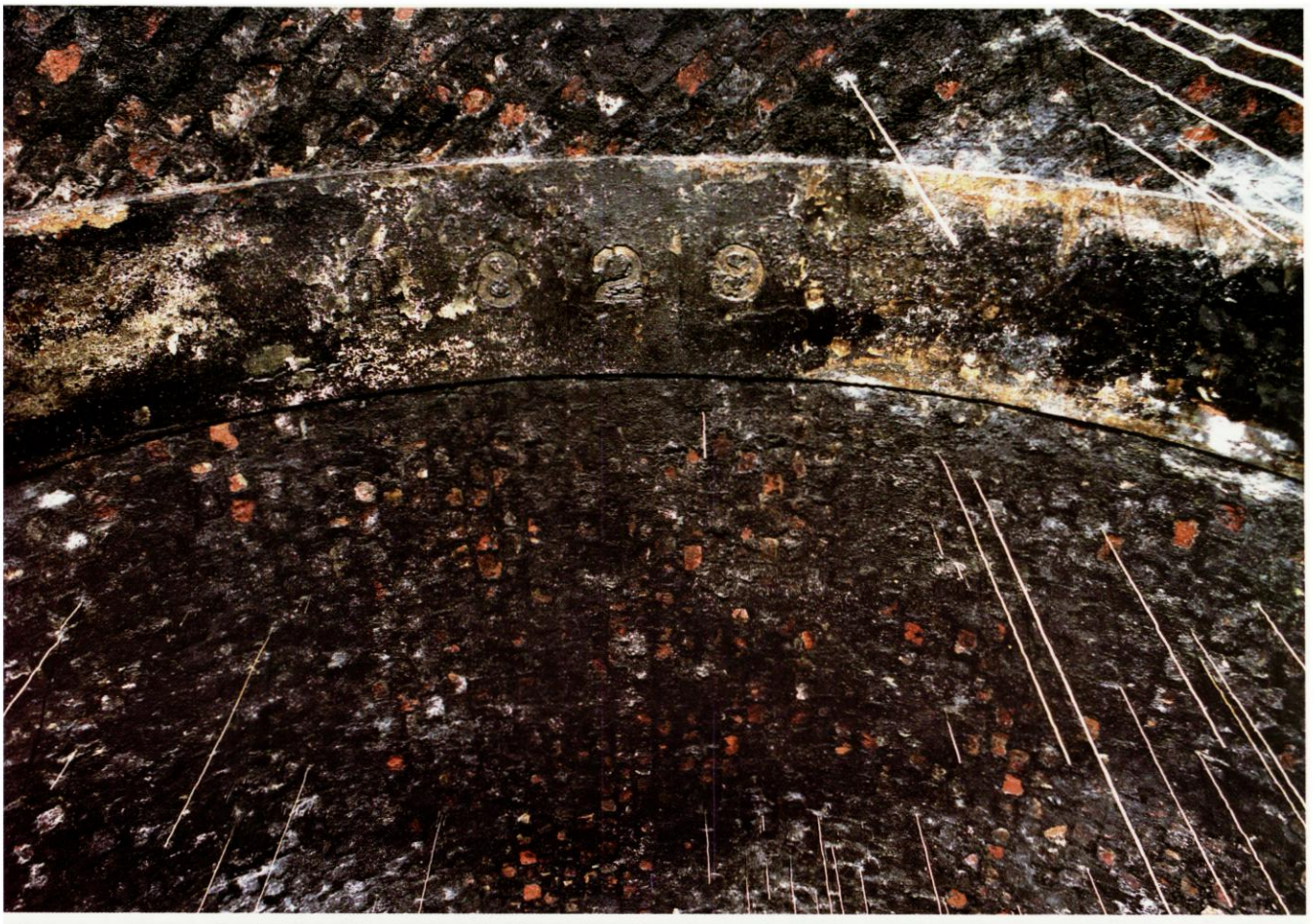
For anybody not familiar with volcanic terrain, the half-hour bus ride on a gravel road from Reykjavik to Bláfjoll, followed by a hike across some of the lava erupted from the vent, is in itself quite exciting.

The recently restored house at Kinver Edge where the Reeves family lived in the 1930s. Photo © National Trust

The Lamson tube room at Corsham. This pneumatic tube system enabled documents, in cylindrical containers, to be transferred quickly and securely between offices over considerable distances. The vertical tubes are for document despatch, the curved, open chutes are for arriving containers. Photo Nick Catford

Looking west towards Wapping Dock from the Edge Hill end of the Wapping Tunnel in 1998. The light seen in the distance is from the Crown Street ventilation shaft which was built in 1896. Photo Nick Catford

Looking east towards Edge Hill from the Wapping Dock end of the Wapping Tunnel in 2013.
The tunnel is flooded to a depth of several feet between here and the White Street ventilation shaft which is the source of the light in the distance. Photo Nick Catford



In the Crown Street tunnel a date stone of 1829 is set into the roof. Photo Nick Catford

The cradle is seen descending 400ft into the crater at Thrihnukagigur volcano; it carries a maximum of 5 people. Visitors are able to spend an hour exploring the chamber. Photo K Maack

Looking northeast along the central tunnel at Godstone Road, Kenley. The shelter is now an underground factory for producing high-precision optics. Photo Nick Catford

The 65ft long banqueting hall beneath Joseph Williamson's House in Liverpool. Entrance to the chamber is through 'the gash' which is seen at the far end. Photo Nick Catford

Planning and construction of Surrey County Council's five World War II deep tunnelled air-raid shelters and related subsurface schemes

Paul W. Sowan

Introduction

This article provides further information on the Godstone Road or Riddlesdown shelter at Kenley (described in *Subterranea* 19 in 2009) and the Brighton Road shelter at Coulsdon (described in *Bull. Subterranea Britannica* 31 in 2000), and new information on the planning and construction of all five Surrey County Council (SCC) tunnelled shelters (intended at the outset to provide bunk accommodation for a total of 7,500 persons), and the abandonment of one of them, as well as abandoned plans to convert mine and quarry tunnels at Godstone and other places as shelters for over 10,000 people. Brief reference is also made to shelter accommodation in pre-existing underground sites in Dorking and Reigate, a 1939 scheme at Reigate, a tunnelled site in Guildford, and emergency planning in the Cold War.

This study is based primarily on an examination of the County Council's Special War Executive Committee's records from 1939 to 1946, but deals only with the planning and construction of the shelters up until they were opened for public use. Evidence from the minutes of the War Emergency Committee of the former Coulsdon & Purley Urban District Council is also examined. The operation, closing down and after-use and present state of the shelters will be considered in a second article to be published in *Subterranea* 34.

THE ADMINISTRATIVE COUNTY OF SURREY IN 1939

Surrey has gained and lost territory from time to time since 1939, notably the losses to the newly created Greater London Councils in 1965, especially in this context the former Urban District Council of Coulsdon & Purley which became a part of the London Borough of Croydon on 1 April that year. Both SCC and its constituent local councils had some part in the provision of underground shelter accommodation, either as newly created tunnelled shelters or by the adaptation of pre-existing mines. Most such shelters were in what was then north-eastern Surrey, reflecting population density, geology favourable to tunnelling, and the presence of a surprising number of mine and underground quarry workings in that part of the county.

Anticipation of war in 1938 / 1939

As early as February 1938 some residents of Dorking suggested tunnelled air-raid shelters should be provided in the town. In 1939 the Council at Reigate produced a plan of the Tunnel Road 'caves' showing their proposed conversion and use for control centre and air-raid shelter purposes.

Surrey County Council resolved on 25 April 1939 to establish a War Emergency Committee (WEC) 'to give directions on all urgent matters arising in connection with Air Raid Precautions, National Service, and kindred matters'. On the outbreak of war on 3 September 1939 the WEC was superseded by the Special War Executive Committee (SWEC) which first met on 25 September 1939.

The Council's Special War Executive Committee and other records

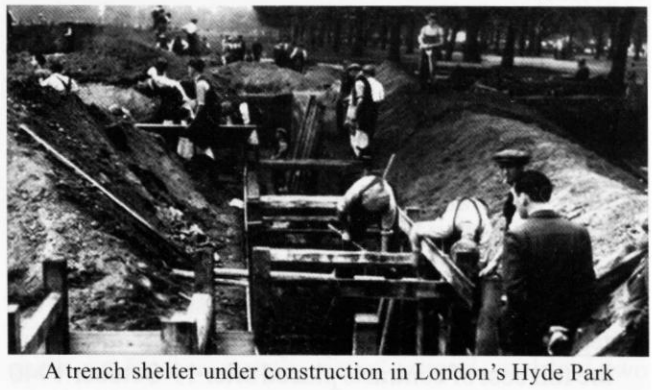
The primary source used has been the 12 bound volumes and three folders of minutes and associated records of the Special War Executive Committee (SWEC), which can be consulted at the Surrey History Centre at Woking. Regrettably this voluminous and not very well indexed file contains no location plans, no original measured engineering drawings for the construction of the shelters, no photographs, and little on the staffing of the shelters or account of them actually in use during air raids. Engineering drawings were presumably retained in the County Engineer's Department, and contracts for construction and deeds relating to land ownership by the Legal Department, and may of course still exist. The SWEC records contain minutes (not formally printed and published) of the committee and of its two sub-committees, reports submitted by the County Engineer, W.P. Robinson, and related correspondence. References are made to documents not preserved in the volumes.

The SWEC was not exclusively concerned with Air Raid Precautions (ARP). Matters dealt with included, for example, bomb damage reports, casualty statistics, conscription of staff, conscientious objectors, motor transport, public assistance, and VD clinics.

Corresponding wartime records for the former Coulsdon & Purley Urban District Council (five volumes of printed minutes available at LB Croydon's Local Studies Library & Archives Service) have also been consulted, along with minor primary and secondary sources listed at the end of the article. Some generally unreliable information has also appeared on various websites.

Shelters in 1940

Until December 1940 discussion and provision of air-raid shelters was limited to built surface shelters (brick structures with reinforced concrete slab roofs), trench



A trench shelter under construction in London's Hyde Park

(cut-and-cover) shelters and adapted basements, for public use and at hospitals and schools. There were several problems with these, including flooding and the theft of hurricane lamps provided for lighting. School shelters were made available for public use out of school hours, but on account of misbehaviour in them had to be made presentable for children the next school day.

A telling commentary of the times was, on 7 February 1940, a list of tasks that might be assigned to those in charge of shelters (of any kind). Men were seen as capable of, for example, lighting and stoking fires, keeping available a regular supply of boiling water, controlling crowds and marshalling people, taking charge of provisions and equipment, and keeping records of food and equipment issued and (in the latter case, presumably) returned. Women, on the other hand, could make and distribute tea, provide food, attend to the washing-up, care for elderly people and children, and provide 'special food' as necessary! Whoever compiled this list was clearly not aware that in both World Wars women very competently drove trains and filled shells in munitions factories. Deepest Surrey was perhaps not entirely up to speed in coping with war.

On 19 August 1940, following reports of air-raid damage at New Malden and Wimbledon, it was reported that there was County Council shelter provision for eleven percent of the population (but only six percent if bunks were installed). It was proposed to provide shelter spaces for a further 75,000 persons in the area overseen by the Eastern Area Emergency Committee within the territory of London Civil Defence Group 9, which would then afford protection for 21 percent of the population (whether on benches or with bunks is not clear). Built, trench and converted basement shelters were still seen to be the appropriate response. By November 1940 the Council had bought two million bricks, presumably for surface shelters with reinforced concrete slab roofs, or for trench shelters similarly roofed.

CENTRAL GOVERNMENT AND THE DEEP TUNNELLED SHELTER QUESTION

A document headed '*Civil Appropriation Account (unclassified votes) 1941'*, evidently extracts from a report issued by the Government's Comptroller and Auditor General filed with SWEC minutes for 31 May 1943, informs us as follows:

> Consequent upon experience of prolonged night raiding the Government's attitude towards the provision of deep-level or equivalent shelters underwent some modification in the Autumn of 1940. Local authorities who considered that tunnel shelters were needed in their areas and that their localities afforded site conditions favourable to their construction were instructed in November 1940 to put forward their proposals in general terms after consultation with the regional technical staff. It was also announced that the full cost of contracts placed after 19 October 1940 for the equipment or construction of all approved shelter accommodation would be reimbursed.

It appears that 'upwards of a score' of local authorities provided deep-level shelters for some 136,000 persons at costs ranging from 'a few shillings to over £ 30 per person'. The overall estimated cost of the schemes was about £ 820,000. Surrey County Council was one of the local authorities to plan and execute a deep shelter programme, confident that central government would reimburse all costs.

DEEP SHELTER PLANNING FOR SURREY COMMENCES

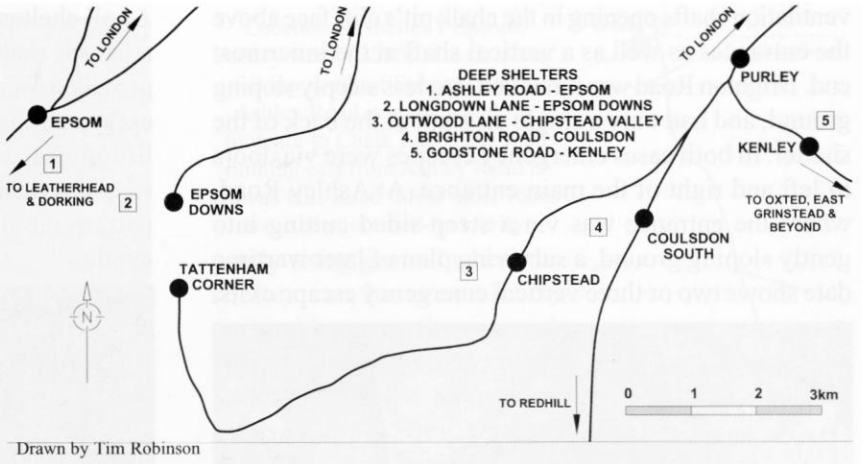
On receipt of a *Ministry of Home Security Circular* (HSC 284/40) issued on 20 November 1940 the SWEC instructed W.P. Robinson, the County Engineer, to submit proposals. A sub-committee composed of the County Engineer and the engineers employed by the local councils for Banstead, Carshalton, Coulsdon & Purley, Epsom & Ewell, and Sutton & Cheam was formed to investigate potential deep shelter sites. Robinson reported on 23 December that he had identified possible sites for deep shelters complying with clauses four and five of the *Circular,* these being in the areas of Coulsdon & Purley UDC, and the Urban District Councils of Banstead and Epsom.

He proposed also to investigate possibly suitable sites at Carshalton, Esher, Malden & Coombe, Richmond and Esher, and noted that accommodation of virtually unlimited extent could be provided by tunnelling into the chalk of the North Downs. Unfortunately a copy of the *Circular* is not preserved in the file, but one may guess that clauses 4 and 5 related to questions of public transport access, and possible traffic congestion. All five selected shelter sites were within a few hundred yards of a railway station. The Carshalton proposal was minuted as 'not approved' in July 1941.

Entrance cutting to Ashley Road shelter

Robinson proposed that five 'initial' deep shelters should be created 'as an experiment', these to be for 1,000 persons each in the Coulsdon & Purley (2), Epsom (2) and Banstead districts. In the event it appears that the

five shelters were designed for 1,500 persons each, not 1,000. The sites were to be finalised and designs prepared by Robinson, who estimated that on the basis of deep shelters having a capacity of 1,500 shelterers in bunks the cost per head would be £ 3–7s–5d (£3.37), or £4-5s-0d (£ 4.25) if for 1,000 persons. Included would be electric lighting (mains and emergency), ventilation, water supply, sanitary conveniences and drainage, blast- and gas-proof entrances, first-aid rooms, and duck-boards. The claim was made that shelter accommodation in deep tunnels would be cheaper, per head, than in numerous surface, basement or shallow shelters. The inclusion of duck-boards seems to suggest that the finished spaces were expected to be wet underfoot, which indeed they were!



Drawn by Tim Robinson

Locations of the five deep shelters in relation to railway stations

Discussions with the Ministry of Home Security led to approval 'in principle' for the creation of spaces for 5,000 persons in tunnelled shelters, and subsequently the authorisation of five deep shelters for 1,500 persons each, totalling 7,500 places (all provided with bunks). These places were to count as a part of the envisaged additional provision for 75,000 persons. Tenders to construct the shelters were invited.

The deep shelter sites selected

The five deep shelters actually started, as numbered (from west to east) by the County Council, were as follows (with variant names appended):

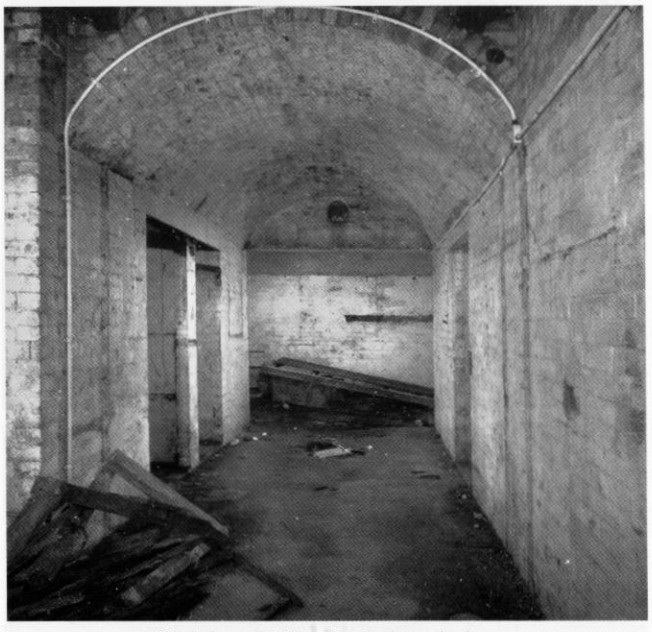
1. Ashley Road, Epsom (near Epsom station) [TQ 211597]
2. Longdown Lane, Epsom (also known as Epsom Downs) (now Longdown Lane South, near Epsom Downs station) [TQ 224594]
3. Outwood Lane, Banstead (in Chipstead Valley, near Chipstead station) [TQ 272580]
4. Brighton Road, Coulsdon (also known as Cane Hill) (near Coulsdon South station) [TQ 292584]
5. Godstone Road, Coulsdon (also known as Kenley or Riddlesdown) (near Kenley station) [TQ 323603]

Shelter 3 at Chipstead Valley was abandoned before completion on account of tunnelling difficulties in soft chalk. Shelter 4 at Brighton Road was not completed to the originally intended capacity.

The shelters were all located with reference to railway stations and in some cases bus routes, and were either in open country or on the outer fringes of the built-up areas. Few people had private cars in 1941 and extensive car parks were not provided.

DEEP SHELTER DESIGN

The shelters were planned to accommodate 1,500 persons each (a total of 7,500), not the 5,000 to 6,000 each suggested by Nick Catford, or the 5,200 at Chipstead

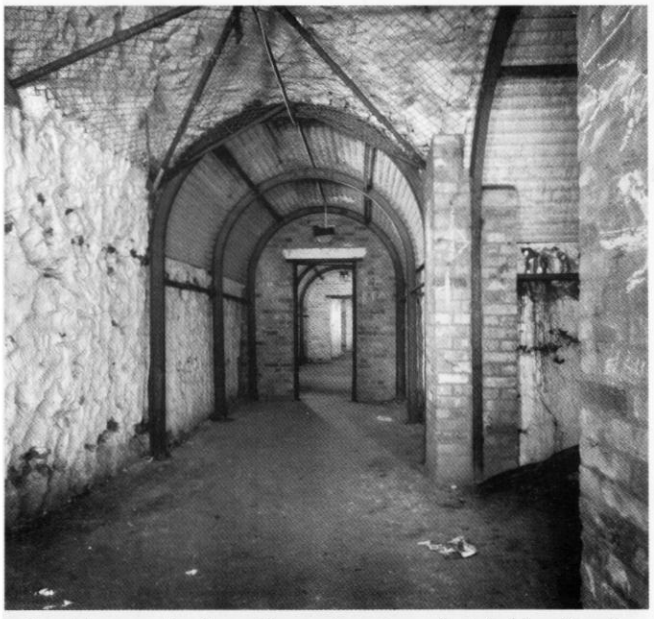


Sick bay in the Coulsdon shelter

Valley mentioned by Harris. Although referred to throughout SWEC records as the 'deep shelters', only that at Godstone Road really deserved such a description, being tunnelled into steeply rising ground and thus having a considerable cover of *in situ* rock above the tunnels. The other four shelters were in gently rising ground, and may in part have been of little more than cut-and-cover construction. Some overlying chalk above the inner ends of the systems was in at least some cases excavated and moved to the front to increase the cover over the shallower parts of the tunnels, augmenting the additional cover created by the use of material excavated from them. The requirement, for this purpose, to raise chalk excavated from the tunnels to spread over the roofs made for logistical problems and increased construction costs.

Although it seems likely that the overall plan for each shelter was standard, with three parallel tunnels into the hillside linked by six lateral tunnels at right angles to them (as seen in the Godstone Road shelter), there were variations in design related to the local features of each site. Godstone Road was tunnelled into a pre-existing chalk pit face in steeply rising ground, and had two

ventilation shafts opening in the chalk pit's cliff face above the entrances as well as a vertical shaft at the innermost end. Brighton Road was tunnelled into less steeply sloping ground, and had only a single air shaft at the back of the shelter. In both cases emergency escapes were via doors to left and right of the main entrance. At Ashley Road, where the entrance was via a steep-sided cutting into gently sloping ground, a surviving plan of later wartime date shows two or three vertical emergency escape exits.



Looking south along the eastern tunnel at Ashley Road. One of the cross passages is seen on the right

Accommodating 1,500 persons underground for any length of time called, obviously, for electric lighting (including standby emergency lighting) as that number of people suddenly plunged into total darkness might be expected to panic with potentially dire consequences. Likewise a reliable water supply had to be laid on. Electricity and water supplies were simple enough to provide. Water would come by gravity from reservoirs or water towers at higher elevations, although of course these might be vulnerable to enemy action.

Drainage and sewerage were more problematic. At both Brighton Road and Godstone Road and possibly Outwood Lane the shelter tunnels are at a higher level than the main sewer under the adjoining road, so gravity alone sufficed. But the two Epsom shelters were below road level (entered via sloping paths in cuttings) and thus not self-draining. At Ashley Road it is known that a sewage sump and pump were installed: these presumably discharged to an existing sewer under the road. At Longdown Lane the shelter floors are significantly below and remote from the road which may or may not at that time have had a sewer. It seems unlikely that an entirely new sewer would have been made down the floor of the dry valley towards Epsom College (none is mentioned in the records). Elsan toilets and small trolleys for conveying them feature in the records and were, possibly, the answer at this location.

At all shelters other than Kenley the tunnels were at a relatively shallow depth, and additional bomb-proofing was provided (or at Chipstead Valley intended) by spreading excavated chalk over the tunnel roofs, calling for powered lifting gear and additional expenditure. This was also supplemented by chalk being taken from above the deeper parts of the shelters and spread above those at shallower depths.

Looking towards the entrance, now blocked, in the central tunnel at Coulsdon

In July 1941 it was proposed to employ 'Mr Gardner of Chislehurst Caves' in a consultative capacity 'to begin with', at a salary not exceeding £350 p.a. Gardner evidently was so appointed, as there is mention in later minutes of his advice on details at the deep shelters. James Geary Gardner [1903–1987] was a resident of Caterham (near Kenley) and the proprietor of Kent Mushrooms Ltd, the firm that still (under the direction of his son who lives in Godstone) operates the Chislehurst 'caves' chalk mine as a tourist attraction. He was initially responsible for the Chislehurst shelter, and is thought also to have attempted mushroom farming after the war in the then disused Godstone Road deep shelter.

CONSTRUCTION

Exactly when, but probably in February 1941, tunnelling started is not clear. But on 29 April 1941 it was reported that during an air raid on the night of 16/17 April members of the public took refuge in some of the part-driven tunnels, particularly at 'Kanes Hill' – corrected in the minutes to 'Riddlesdown' (at Godstone Road) – although presumably 'Cane Hill' (at Brighton Road, Coulsdon) had been intended to be read.

The Committee considered this practice to be 'unsafe and unsatisfactory' but it was decided that out of working hours the unfinished shelters should not be barricaded so as to prevent access, but that 'notices should be prominently exhibited stating that use of the tunnels whilst work is proceeding is dangerous and that any person entering on the site would do so at his own risk'.

In May 1941 construction of the five shelters was reported to be 'well in hand' although formal sanction had not yet been received from the Ministry of Home

This appears to be the end of one of the unfinished tunnels at the Brighton Road shelter. Although the in situ chalk seen here is evidently sound, the shelter was not completed according to plan as chalk above ceiling level was found to be insufficiently strong

Security. The Ministry had raised no objection to work proceeding, however, although noting that at Outwood Lane (Chipstead Valley) 'it had been found necessary to do a certain amount of lining'. In July 1941 it was reported that 'at least two' of the shelters were 'nearing completion' and that arrangements for their management would need to be considered. Shelter marshals (voluntary if possible) would have to be appointed.

Some details of furniture and equipment appear in the account below of the formal opening of the Godstone Road shelter. Formal opening dates for the other shelters have not been established; although the impression is gained that none was really serviceable until 1942. Most noteworthy was the use of timber-framed bunks with canvas / hessian supports: these gave much trouble during the shelters' operational lives.

Modern photographs of the interiors of the Ashley Road, Brighton Road, and Godstone Road shelters have been published (Catford, 2013).

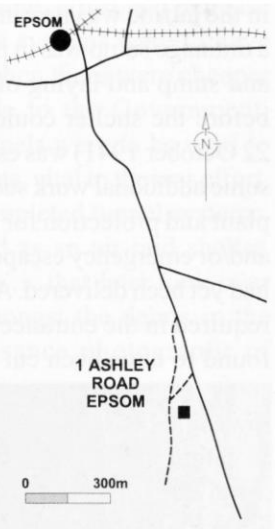
THE FIVE DEEP SHELTERS DESCRIBED

Shelter 1: the Ashley Road shelter at Epsom [TQ 211597]

The site

This wooded site lies on the west side of Ashley Road, between the road and a footpath signposted to Chalk Lane, surrounded by a wire-mesh fence. There is a pair of locked gates fronting the road, near bus stops and a traffic speed monitor. It is most easily and safely viewed from the footpath. The site is less than a mile from Epsom station, about 20 minutes' walk.

The tunnels are driven from the lower end of a steep-sided cutting sloping down to the south. This is cut into



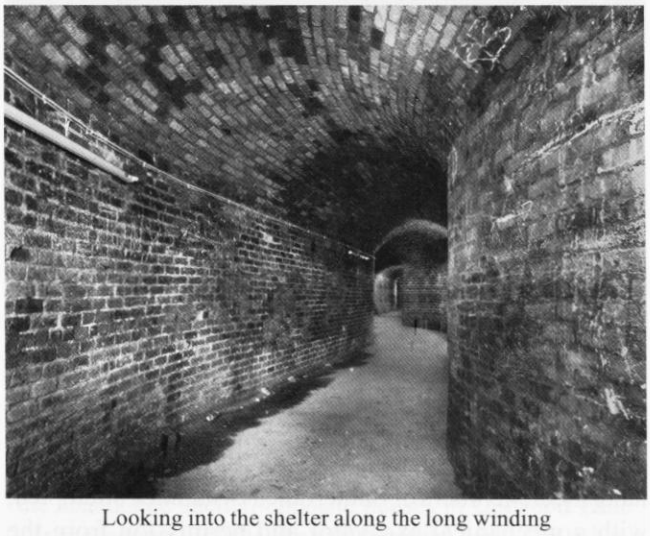
Location of Shelter 1 Epsom, Ashley Road (B290). This is about 1.2 km south of Epsom station. Ashley Road is shown, and the footpath to Chalk Lane. The road running east from Ashley Road is Downs Hill Road. Most other roads have been omitted for clarity

Drawn by Tim Robinson

gently rising ground where the shelter can be seen clearly covered by an earthen mound. Photographs of the entry cutting and the interior have been published by Nick Catford (2013). The tunnels are currently used by an 'airsoft gaming' group, whose members' vehicles may sometimes be seen parked within the fence.

What the records reveal

The contractors appointed were Lavender McMillan & Co Ltd. On 9 June 1941 the County Engineer was asked to 'press the contractors in regard to the performance of their contract' and 'failing satisfactory improvement during the next week' he was to report back 'with a view to the termination of the contract'. By 11 June they had excavated 1,522 linear feet (of a planned total of 2,323 feet) of tunnel, 65.5 percent of the planned shelter.

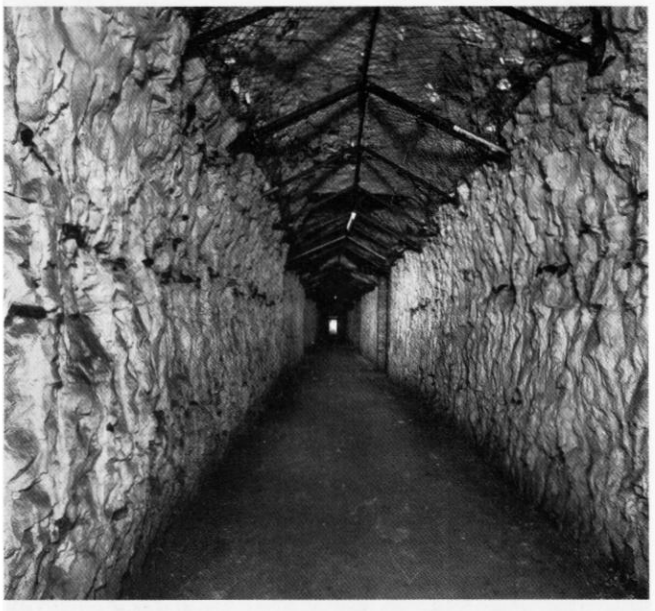


Looking into the shelter along the long winding entrance tunnel at Ashley Road

The chalk was reportedly hard, resulting in the ceiling requiring little propping. However a roof fall on 13 June had resulted in the death of a workman. It was estimated that tunnelling would be completed in about five weeks. Lining had been installed as required. These contractors had 'not given entirely satisfactory service owing to labour troubles and inadequate suitable plant' and the County Engineer proposed to 'continue to press them' as 'their costs are much higher than those of J.B. Edwards & Co' of Kenley, who had the Godstone Road contract.

A progress report in October 1941 stated that the whole of the excavation for this shelter had been completed. The entrance tunnel had been brick-lined, and brickwork

in the latrine was nearing completion and excavation for a drainage sump was in progress. Completion of the lining and sump and laying of concrete floors were necessary before the shelter could be occupied. Six weeks (from 22 October 1941) was estimated for completion, although some additional work such as the installation of ventilation plant and protection for the tops of shafts (for ventilation and/or emergency escape) was still outstanding. No bunks had yet been delivered. Additional work was subsequently required in the entrance cutting, the sides of which were found to have been cut at too steep an angle.



The north end of the eastern tunnel at Ashley Road

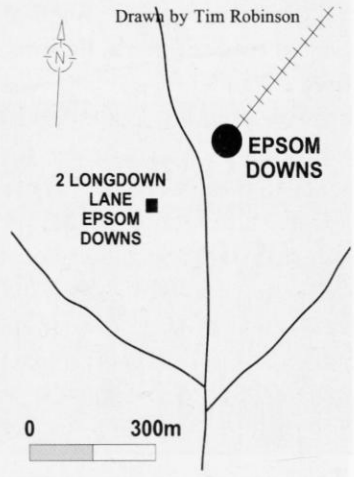
Shelter 2: the Longdown Lane shelter at Epsom Downs [TQ 224594]

The site

The shelter, very effectively sealed, lies on the west side of Longdown Lane South below a prominent earthen mound on the Epsom Golf Club's course, in gently sloping ground towards the upper end of a shallow dry valley. It appears to be at least of partially cut-and-cover construction. Its outline is shown clearly on large-scale Ordnance Survey maps. This shelter appears to have had a sloping ramp access in a cutting which has been landfilled. Members of Subterranea Britannica attempted, with a mechanical excavator and permission from the golf club, to regain access some years ago, but were unsuccessful.

The site is about 300 yards from the former site of Epsom Downs station which, in 1941, fronted the road. Also nearby is Tattenham Corner station. Both stations were built for race traffic and recreational purposes for visitors to the Downs, and at the material time had respectively nine and six passenger train platforms as well as extensive carriage stabling sidings, so would have been well able to accommodate over 1,000 would-be shelterers arriving by rail.

In recent years Epsom Downs station has been set back to a new site about 250 metres from the road. The previous (extensive) station site and sidings are now occupied by modern housing in Bunbury Way. The station is now no more than a single platform and passenger shelter. Tattenham Corner station now has three platforms in use, and a modern station building.



Location of Shelter 2 Epsom, Longdown Lane (B288) on a golf course. Epsom Downs station is shown at its location in 1941. The former station site is now occupied by a modern housing estate in Bunbury Way, with the present station set back about 250 metres from its former position fronting Longdown Lane. The shelter is about 300 metres from the former station site. Tattenham Corner station (not shown) is about 1.3 km to the south. Burgh Heath Road and Fir Tree Road are also shown

What the records reveal

On 12 May 1941 Robinson reported that Sir Alexander Rouse had inspected the two deep shelters at Epsom and suggested that, in order to test the safety of the tunnels, a bomb should be exploded over one of them to observe the effects. Robinson indicated his approval, adding that the test would be a severe one as the bomb would be exploded at a depth below the ground surface in excess of that to which a 250 kg bomb would penetrate in the redeposited chalk subsoil. The committee concurred. This exercise was carried out at the Longdown Lane shelter on 10 June.

The 550-pound German bomb was placed 'dead centre' over one of the tunnels. The bomb had been sunk to a depth of 23 feet six inches below ground level in 'solid chalk', eighteen feet six inches above the tunnel roof. Mice and canaries in cages, and instruments for measuring vibration, had been placed at various points underground. The device was detonated by Ministry of Home Security Research Department staff with no reported effects on the animals or birds, although 'some chalk fell within a 16 feet radius of the point immediately below the bomb'. This exercise was costed at £405, later revised to around £1000.

A report dated 11 June 1941 stated that 69.5 percent of the planned tunnels (1,680 feet of the intended total of 2,424 feet) had been excavated. The chalk was found to be hard, with little need for propping. Completion of tunnelling was expected within four weeks.

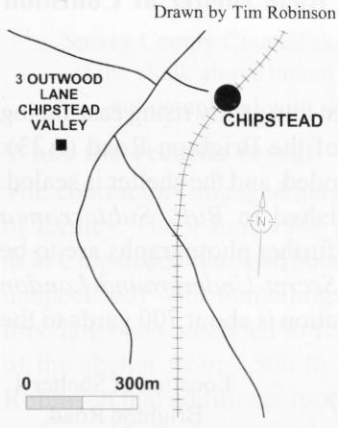
On 22 October 1941 Robinson reported that the excavation work had been completed, along with about half the brick lining. The canteen, lavatories and medical aid post were about 85 percent completed. All the required

bunks had been delivered, and the shelter 'could be occupied' in four weeks.

Shelter 3: the Outwood Lane (Chipstead Valley) shelter at Banstead [TQ 272580]

The site

The site of this unfinished shelter has for some years been a matter of speculation, as it was abandoned after only 400 feet or so had been tunnelled, and has been collapsed and/or sealed and lost from view for many years. Scrub clearance by wildlife conservation volunteers on 'Stagbury Downs' (land between Banstead Wood and Outwood Lane) in or about 2012 revealed details that made positive identification possible. Stagbury House once stood opposite on the other side of the valley. Graham Harris (2013) noted that in walking from the car park on Holly Lane (B2219) across Stagbury Field towards Banstead Woods, disturbed ground could be seen down-slope towards Outwood Lane. The exact location appears to be at TQ 272580 on the south side of Holly Lane.



Location of Shelter 3 Chipstead Valley, on Outwood Lane (B2032). The shelter site, about 500 metres from Chipstead station, is in open land almost opposite Hazelwood Lane. Further west along Outwood Lane is the *Travellers' Rest* public house, which was not licensed premises in 1941. Holly Lane (B2219) to Banstead is shown in the NW corner

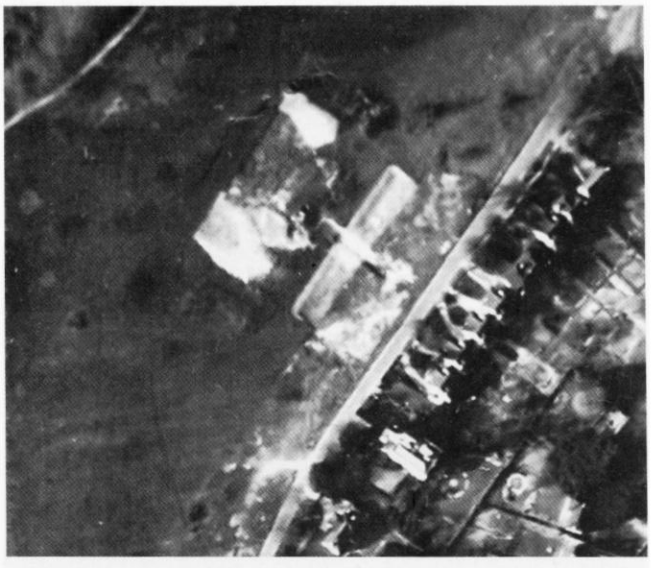
He described a shallow rectangular depression and, nearby in a small scrub area, a small crater: the scrub has now been cleared. With the assistance of Roger Findlay of the Banstead History Society these features were confirmed to be 'the remains of a WWII tunnel system that was abandoned when part of the tunnel collapsed'. He continues as follows:

> There were three tunnels dug into the hillside, running in the direction of Banstead Woods where they connected with four lateral tunnels. The tunnels were designed to house some 5,200 bunk beds with the provision of a sick bay and canteen facilities. The crater in the scrub area would appear to be an air shaft. Chalk from the diggings was piled on top of the tunnels to provide extra protection from bomb penetration, and further spoil was piled at the tunnel entrances to act as a blast wall.

The suggested capacity is of course a gross exaggeration. Harris then refers to the other four deep shelter sites, and continues …

> But what were these tunnel systems going to be used for? The story put out at the time was that they were intended to be used to house bombed-out Londoners, but it seems a great deal of time, effort and expense for this purpose. The tunnels systems were to have cost £71,000 at that time – when there were cheaper and easier options available to the Government. Another story is that the tunnels were to be used to house Whitehall's civil servants, vital to the war effort. In fact, at least one of the completed tunnel systems, the one at Kenley, was used as an air-raid shelter. Intriguingly, the optical firm … that later took over the Cane Hill site found amongst the debris in the tunnels wartime reconnaissance photographs of Berlin!

Three photographs accompany Harris' account. Two, credited to Graham Kenward, are captioned 'crater of air shaft' and 'wood support for air shaft'. The third, credited to the Banstead History Society, is an aerial photograph stated to date from just after the war. This shows the as yet unvegetated freshly dug chalk at the abandoned shelter, and a line of filled-in tank traps. Twenty-one-inch diameter steel ventilation tubes were used for the air shafts, and remain in position at Brighton and Godstone Roads. Postwar documentation in the



Vertical aerial photograph of the Outwood Lane deep shelter site in Stagbury Fields, thought to date from the early or mid-l940s. Bare chalk (in-situ and dumped) shows the site of the abandoned shelter, opposite houses in Outwood Lane. Tree shadows indicate sunlight from the west. Chalk has evidently been removed from two areas at the top of the site up-slope from Outwood Lane, although it seems not to have been spread over the still vegetated lower part of the slope where tunnelling would have been at a shallower depth where additional bomb-proofing would have been needed. Instead it appears to have been conveyed over an elevated roadway spanning the lower excavation and tipped to spoil closer to the road. The lower rectangular area clearly reveals an excavated chalk face parallel with Outwood Lane, into which presumably three tunnels were to have been driven, although whether all three were commenced is not known. The dark linear feature, not a shadow, is presumably a contractors' access road to the tunnels, which seem to have had one or more entrances in the chalk face at right angles to it

SWEC files notes that all salvageable materials were to have been removed from all shelters including, at Outwood Lane, digging out the tube. Chipstead station is about 500 yards from the site.

Harris' account concludes with the remark that the disturbed ground is host to the Horseshoe vetch [*Hippocrepis comosa*], the food plant for the Chalkhill blue butterfly [*Lysandra coridon*], this being the only recorded local site for these species.

Subsequently R.F. Cockerill noted that during long, hot, dry summers the outline of the shelter area is revealed by differences in the vegetation: what are usually called 'crop marks' are a well-known clue used by archaeologists to detect disturbed ground and buried foundations and the like. He also notes, nearby, a dug-out for a machine-gun post, and the discovery near it of part of a smoke grenade.

Site visit

On 23 June 2013 I attempted to find the features described above. Guided by the aerial photograph I located what appeared to be the crater, which has a single horizontal timber beam protruding about two feet from one side resembling that shown in the photograph,. The 'shallow rectangular depression' perhaps called for the 'eye of faith' and the lower slope nearer Holly Lane, still under bushes and shrubs, seemed undisturbed (other than by rabbit burrows). This area is opposite houses on five or six plots beyond the junction of Outwood Lane with Hazelwood Lane.

This small crater is the only remaining visible field evidence for the long abandoned Outwood Lane shelter. It is evidently the result of the ventilation shaft running-in as a result of the 21-inch diameter steel pipe being removed for scrap at the end of the war.

The aerial photograph is convincing, and from the point of view of public access during the war the location is eminently suitable, being around 500 yards from Chipstead Station.

What the records reveal

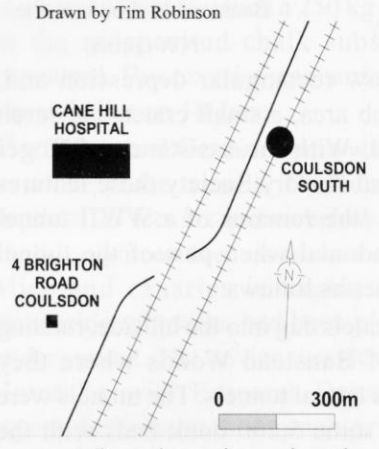
Concern at the need for lining had been expressed in May 1941. The following month, on 9 June, it was reported that a total of 402 feet (of a planned 2,471 feet) of tunnel had been driven (about 16 percent of that intended) by 23 May when 'work was suspended by order of the Ministry of Home Security'. The chalk at this site 'although hard below roof level' was found to be 'so soft at and above roof level that the whole of the tunnel had to be timbered'. Evidently secure tunnel ceilings would be achievable only at significant additional expense.

It was observed, however, that 'there is no reason why the 400 feet completed should not be used either as a store or as a shelter' if provided with 'lighting, ventilation and sanitation' at an estimated cost of £500 over and above the £4,725 already incurred. Two hundred and twenty-eight persons in bunks could be accommodated. This proposal was to be submitted to the Ministry, but no further work at this site was to be undertaken unless sanctioned. This seems to have been the end of things at this site, as shelter 3 disappears from the SWEC minutes apart from subsequent recriminations over the cost over-run of all five shelters.

Shelter 4: the Brighton Road shelter at Coulsdon [TQ 292584]

The site

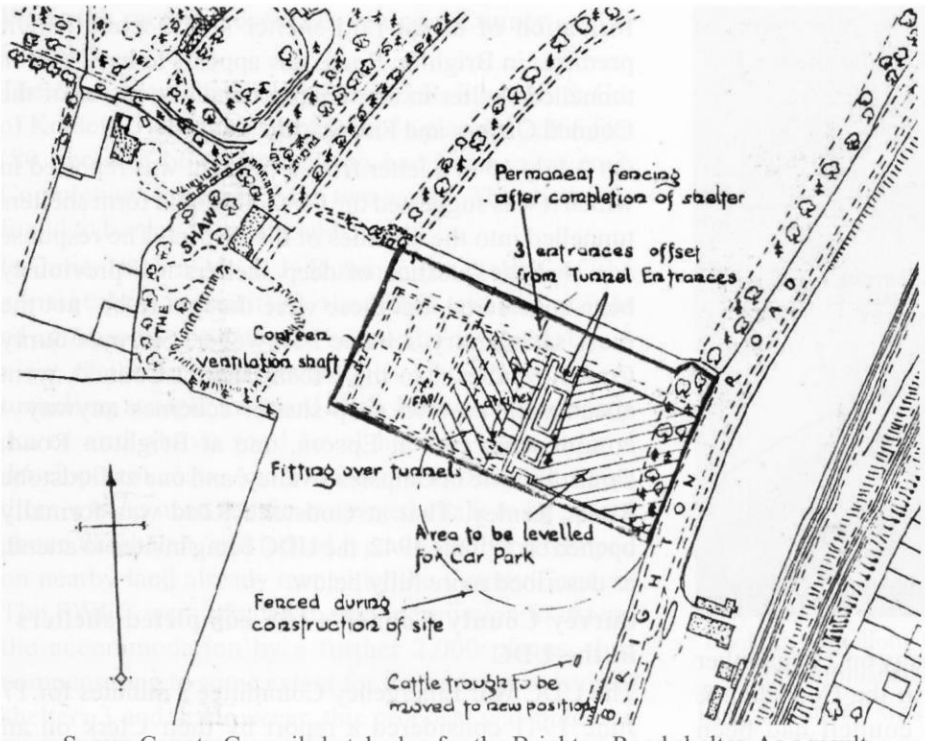
Here the tunnels were driven into gently rising east-facing ground on the west side of the Brighton Road (A23). The site is now heavily wooded, and the shelter is sealed. A description was published in *Bull. Subterranea Britannica* 31 (2000) and further photographs are to be found in Nick Catford's *Secret Underground London* (2013). Coulsdon South station is about 700 yards to the north.



Location of Shelter 4 Brighton Road, Coulsdon (A23), about 700 metres from Coulsdon South station on the original main London to Brighton railway line. The 'fast' Quarry line is also shown, as is the site of the former Cane Hill Hospital, which could be reached by a footpath (no longer in use) from the main road up the north side of the site.

Suggestions made on a website that this shelter was the property of the London County Council, or that it was used by Canadian military personnel for wartime storage, cannot be substantiated.

This shelter was used for a while (according to Nick Catford) as a 'garage or workshop', and the discovery by him of a railway signal in the tunnels suggests an association with the former Thomas Haywood & Sons Ltd's Falcon Works on the opposite side of the Brighton Road. A history of Haywood's has been published (Palmer, 2009) but does not mention the tunnels.


Permanent fencing after completion of shelter
3 entrances offset from Tunnel Entrances
Canteen
Ventilation shaft
Fitting over tunnels
Area to be levelled for Car Park
Fenced during construction of site
Cattle trough to be moved to new position

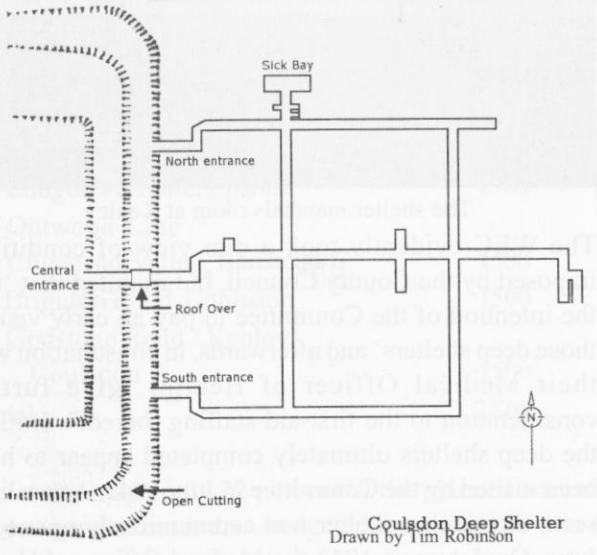
Surrey County Council sketch plan for the Brighton Road shelter. As a result of the chalk above tunnel ceiling being insufficiently strong the shelter was not completed with six cross passages as intended and shown here.

What the records reveal

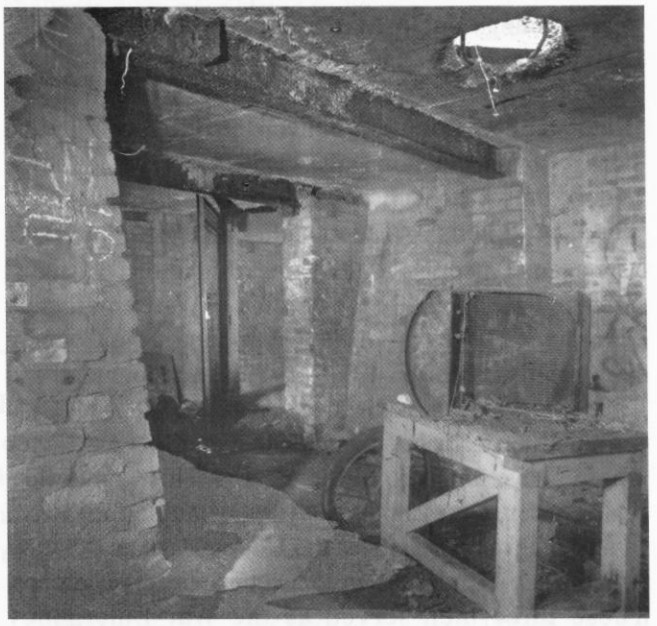
The contractors engaged here were J.B. Edwards & Co of Kenley. The 9 June 1941 progress report notes that, as at Chipstead, there had been problems (in this instance unspecified) with tunnelling. The scheme here had by this date been amended to reduce the planned capacity of the shelter from 1,500 to 720 places. A proposal by Robinson that additional roof support by the use of steel wire-mesh in tubular frames should be installed at an additional cost of £3,300 was minuted.

By 11 June 1941 about 914 feet (of 2,060 feet) of tunnelling had been completed, or 44 percent of that planned. The chalk was reported to be of poor quality, and much of the ceiling had had to be supported. It was recommended that the shelter size here should be reduced from 2,060 feet to 1,223 feet, leaving 309 feet of tunnelling to complete, estimated to take a further two weeks. Bunk spaces would thereby be reduced from 1,500 to 720, resulting in the estimated cost per head at this shelter rising from £4–13s–0d to £8–12s–0d. The total cost of the amended Shelter 4 would be £6,380 as against the original estimate for the larger shelter as planned of £7,038.

The 22 October 1941 report noted that all excavation had been completed, and most of the bunks had arrived. Completion of the canteen, lavatories and medical post was expected to render the shelter fit for occupation in about four weeks.



Coulsdon shelter as built; only two of the planned six cross passages were built, another was started but not completed,



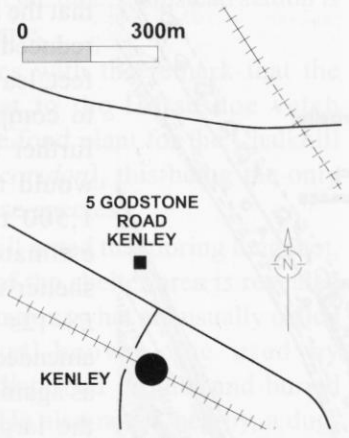
The dog-leg in the central tunnel at Brighton Road. After the main entrance was sealed a hole was knocked through the roof of the tunnel to gain access. This has been sealed and reopened on numerous occasions over the last 20 years. The shelter is currently not accessible.

Shelter 5: the Godstone Road or Riddlesdown shelter at Kenley [TQ 323603]

The site

The Kenley shelter tunnels were driven into the face of a small pre-existing roadside chalk pit on the east side of the road in steeply rising ground. They are at present occupied by Optical Surfaces Ltd, and have been described and illustrated in some detail in *Subterranea* 19 (2009) and in Nick Catford's *Secret Underground*

London (2013). Kenley station, the other side of Godstone Road, is within 300 yards of the shelter.



Drawn by Tim Robinson

Location of Shelter 5 Kenley on Godstone Road (A22), about 300 metres from Kenley station. The other railway shown, mostly in tunnel at this point, is the Oxted line for trains from Croydon to East Grinstead and Uckfield. Mitchley Avenue is seen crossing the north side of the map. Local rumours of an underground link from the deep shelter to the Riddlesdown rail tunnel are false

What the records reveal (1) – Coulsdon & Purley UDC

When Britain declared war on Germany on 3 September 1939, there was no great surprise in the Coulsdon & Purley Urban District. The local council had been considering preparations for war for at least the preceding year. An Air Raid Precautions Committee had been established, and considered the question of shelters at their meetings on 15 March and 8 May 1939. At the latter meeting the Council's Surveyor reported on options such as the conversion of a 'covered soakage pit' at Brighton Road, Coulsdon; conversion of an underground storage tank at Garston Hall, Kenley; and consideration of deep tunnelled shelters in the North Downs. None of those suggestions was adopted.

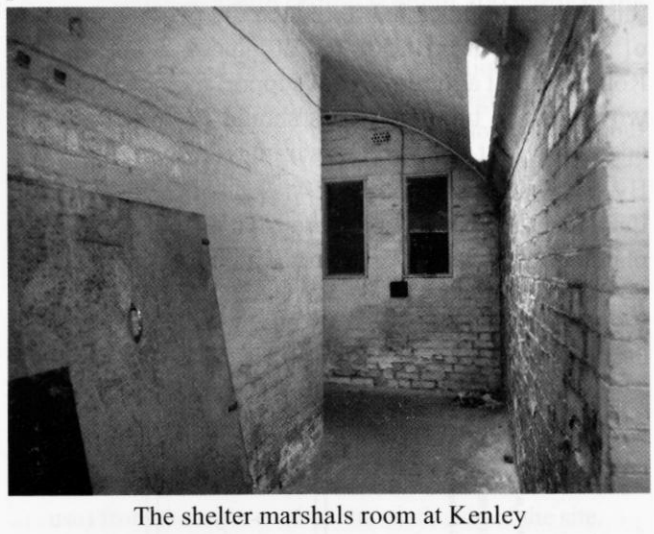
At a special meeting of the Council held on 31 August 1939 it was decided to establish a War Emergency Committee consisting of the Chairman of the Council, James Herbert Morton [1885–1952], an accountant; and Councillors Frederick George Kerswell [1883–1953], a retired linen merchant; and R.H. Sharp AMIAE, for whom I have found no further details. This Committee, which at times met almost daily, was 'authorised to act in any matter on behalf of the Council', in association with the Sub-Committee, in connection with civil defence. These three men served as the War Emergency Committee throughout the war, being disbanded in 1946.

They lost no time in setting to work. On 2 September 1939 there was consideration of requisitioning the Imperial Ice Rink at Purley as a mortuary, for example. Most of the shelters formed were brick-built surface structures with concrete roofs, adapted basements, and of course later Anderson and Morrison shelters at domestic properties. Further consideration was, however, given to underground shelters. On 14 September 1939 an offer made by Sir Bertram Jones that his 'cave' at The White House, Limpsfield Road (Sanderstead), could be used as a Warden's Post was accepted: whether this was a rock-cut cellar in the chalk or not is not made clear. The Council did instruct its surveyor to proceed with the formation of an air-raid shelter at the rear of their premises in Brighton Road: this appears to have been a tunnelled shelter in the rising ground at the rear of the Council Offices and Fire Station.

On 2 July 1940 a letter from a resident was reported in which it was suggested the Council should form shelters tunnelled into the hillsides of the district. The response was that the question of deep shelters had previously been considered, but these were thought to be 'not the most satisfactory scheme'. However, Surrey County Council, rather than the Urban District Council, went ahead with its own deep-shelter schemes anyway – commencing two at Epsom, one at Brighton Road, Coulsdon, one in Chipstead Valley, and one at Godstone Road, Kenley. That at Godstone Road was formally opened on 13 June 1942, the UDC being invited to attend, as described more fully below.

Surrey County Council's two completed shelters in the UDC

The UDC War Emergency Committee's minutes for 17 June 1941 considered a report by their Clerk on an interview he had had with one Admiral Oldham concerning access to the deep shelters then 'in course of construction' by the County Council. There was a suggestion that the County Council would consider issuing shelter tickets to local residents who were 'entitled to free shelter'. Admiral Oldham also raised the question of staffing the shelters with first-aid personnel, presumably recruited locally.



The shelter marshals room at Kenley

The WEC evidently took a dim view of conditions imposed by the County Council, but minuted that 'it is the intention of the Committee to pay an early visit to those deep shelters' and afterwards, in consultation with their Medical Officer of Health, 'give further consideration to the first-aid staffing thereof'. Both of the deep shelters ultimately completed appear to have been visited by the Committee in July 1941. As we have seen, the Kenley shelter was ceremoniously opened in June. On 4 August 1942 the Medical Officer of Health reported on bedding in the shelters (allocated by the County Council), and its storage was discussed.

What the records reveal (2) – Surrey County Council

The contractors for Shelter 5 were J.B. Edwards & Co, of Kenley. By 11 June 1,814 feet of a planned 2,266 feet (80 percent) of the tunnelling had been excavated. Completion was expected in two weeks. The chalk was found to be 'hard and of good quality'.

In June 1941 a Mr E.J. Rimmer (on behalf of the contractors) submitted that this shelter might advantageously be extended beyond its designed size, in view of the 'natural advantages of the site' where tunnelling straight into hard chalk below a deep natural cover and above road level had resulted in low development costs. Another factor was that at this site, there was no need for the excavated chalk to be placed above the shelter, and indeed it could easily be dumped on nearby land already owned by the County Council. The SWEC were minded to seek permission to extend the accommodation by a further 2,000 places, thus compensating to some extent for the under-provision at shelters 3 and 4. However, this proposal was noted on 22 September 1941 as not authorised.

Here again, all tunnelling had been completed by October 1941, and about half the lining finished. The canteen, lavatories and medical posts were all ready for use, and concreting of the floors had commenced. All the bunks had arrived: 'Work should be sufficiently advanced to allow occupation in four weeks, although certain work in connection with ventilation and permanent lighting would have to be carried out after that time'.

This shelter (Fookes, 2012) is known from a local newspaper report to have been formally opened in June 1942.

Looking west along the central tunnel at Coulsdon. One of the unfinished cross tunnels is seen on the right

In September it was noted that to some extent additional costs had been incurred in meeting extra works required by the Ministry, comprising *inter alia* lining, blast walls, and protection for ventilation shafts. Revised costs per shelterer were now stated to be …

Shelter	
Revised cost per head	
1. Ashley Road, Epsom	£13-17s-0d
2. Longdown Lane, Epsom	£8-0s-0d
4. Brighton Road, Coulsdon	£13-15s-9d
5. Godstone Road, Coulsdon (Kenley)	£8-14s-0d

OVERVIEW OF THE DEEP SHELTERS SCHEME IN JUNE 1941

With no shelters yet completed for occupation, one shelter on the verge of being abandoned and another planned for a reduced capacity, the following statistics were compiled.

Shelter	**Accommodation (planned)**	**Accommodation (revised)**	**Estimated cost £**	**Estimated cost amended £**
1. Ashley Road, Epsom	1500	1500	6,989	11,688
2. Longdown Lane, Epsom	1500	1500	7,158	7,148
3. Outwood Lane / Chipstead Valley, Banstead	1500	228	6,571	5,128
4. Brighton Road, Coulsdon	1500	720	7,037	6,380
5. Godstone Road / Kenley, Coulsdon	1500	1500	6,422	6,422
Total	7,500	5,448	£34,177	£36,766

So at this stage only 72 percent of the planned accommodation seemed likely to be completed, expected to cost seven percent more than budgeted for around £4-18s-0d per head – somewhat more then the estimated £3-7s-5d.

THE GODSTONE ROAD SHELTER FORMAL OPENING IN JUNE 1942

The only located account of and date for a formal shelter opening is for the Godstone Road shelter at Kenley, on Saturday 13 June 1942. A report in the *Caterham Times & Surrey County Mail* of Friday 19 June throws some light on the internal arrangement of the place.

Inside the shelter F.H. Jones, Chairman of Surrey County Council, addressed the chairman and councillors of the Coulsdon & Purley Urban District and their partners, claiming that 'So far as human knowledge can tell, this shelter is safe from all bombing.'

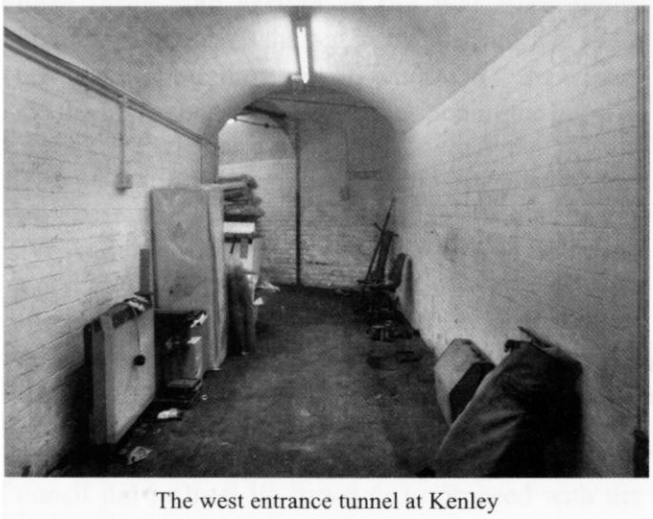
> 'The district is exceedingly fortunate in having such a shelter, which is proof against the biggest bomb yet known. The most powerful bomb that we can conceive could not penetrate even half-way through the earth [chalk] above the part [of the shelter] nearest to the surface, and could only penetrate one-tenth of the way over the deepest part.'

Jones would not of course have been aware of the early stages of the development of the world's first 'atom bomb', two versions of which were to destroy the Japanese cities of Hiroshima and Nagasaki in the summer of 1945.

He informed his guests that at the three shelter entrances (in the face of a pre-existing chalk pit) there was 40 feet of chalk between the tunnel ceilings and the downland above. At the innermost end of the shelter (where a 21-inch-diameter vertical ventilation pipe to the surface was provided) the cover was reportedly 130 feet.

Internal layout and facilities described

The 100 guests listened to these and other details in the 'central hall' which, from inspection in 2009, cannot have been as spacious as that number suggests. Presumably the councillors and their partners were all very good friends, as such a throng could not have enjoyed their customary 'personal space' in the narrow tunnels and small rooms. The 'central hall' was presumably the largest void in the complex at the innermost end of the central tunnel; this has a floor area, from memory, of rather less than an average school classroom designed for a class of 30 adolescents!



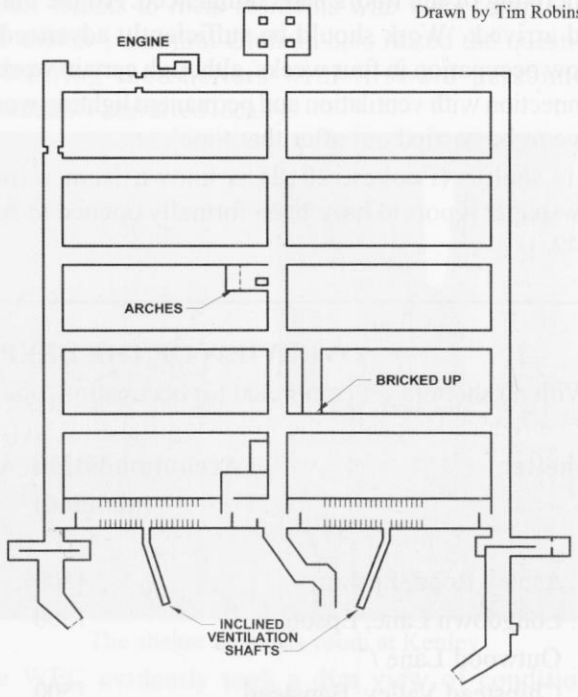
The west entrance tunnel at Kenley

Adjoining the 'central hall', the guests were informed, was the canteen. The next nearest 'room' is in fact on the main or central tunnel around 100 feet closer to the main entrance, this space being large enough for a kitchen but hardly for seating any considerable number of people. This is confirmed later in the report, where the 'self-contained canteen' is described as 'in the centre gallery near the entrance'. This canteen was 'fitted with electrical apparatus for cooking' and the whole shelter was electrically lit.

Equipment supplied by the Ministry of Food included a '17˚ gallon water boiler, electrically heated including a 9 gallon soup container (5 kw); a 10 gallon domestic water boiler electrically heated (3 kw); a 5 gallon insulated urn; two 2 gallon pouring cans; three plywood confectionery cases and hot water cupboards for snacks'. It seems 'main meals' would have to be of the shelterers' own devising, within their ration-book allocations. One has an image of hundreds of people snacking at their allocated bunks. Nothing is said about keeping the place clean and tidy or, indeed, free of hungry mice!

Referring to the somewhat chilly atmosphere of the place, for there was no heating, Chairman Jones said the temperature of the place would be raised materially when, instead of being empty, it contained 1,500 people.

Drawn by Tim Robinson



KENLEY SHELTER

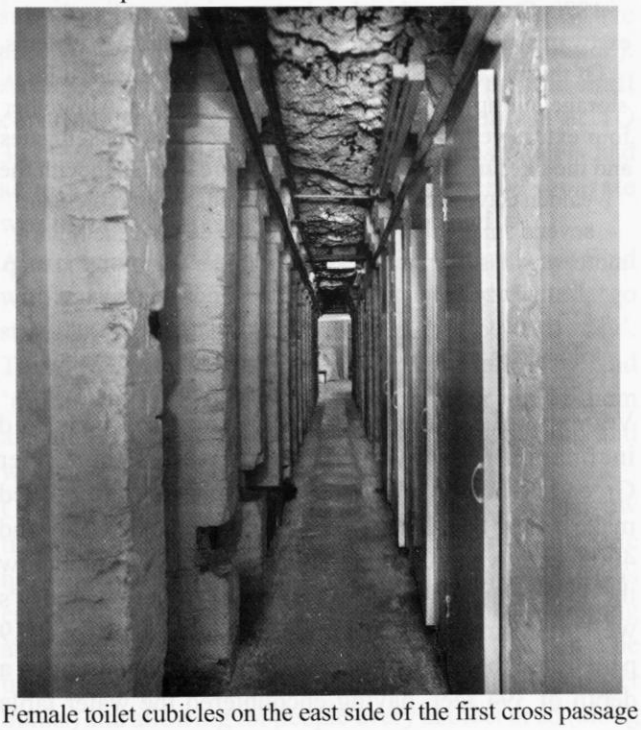
Plan of the Godstone Road shelter as completed. The engine was an air extraction fan located at the base of the vertical air shaft. The inclined ventilation shafts opened in the chalk face above the entrances. The large room at the innermost end of the shelter appears to have four support pillars and is of unknown function. The canteen was at the point labelled 'arches' and the warden's room was close to the central entrance. WC cubicles and urinals are located in the first cross passage. Contrary to local folklore there is no connection from the shelter to the Riddlesdown railway tunnel 200 metres away.

A Mr Harold Lawrence appears to have been a permanently retained 'shelter marshal' and one supposes maintained some sort of rota for shelterers to collect food and drinks to be taken back to their allotted spaces: the tunnels had two-tier bunks down each side. In such a confined space, Lawrence might have been well advised to devise some sort of 'one-way-system' for moving around, if my schoolmaster memory of change of lessons even in a school for only 900 pupils is anything to go by!

There seems to have been no kind of internal communications system. Perhaps Lawrence appointed an *ad hoc* team of deputy marshals or 'runners' to convey information in the labyrinth of three main tunnels each over 200 feet long, and six somewhat shorter cross tunnels (one of which was essentially reserved for urinals and lavatory cubicles).

The shelter marshal was provided with a room 'near the entrance', presumably one of the spaces on the left just inside the main (central) door. During the 'off-blitz' times 'the marshal would lead a rather lonely existence' so it seems he lived on site. There is no mention of a deputy to cover his sleeping hours. A 'medical aid post' is also mentioned.

The June 1942 report also gives some details concerning ventilation. Air was drawn in through one or more of the entrances and/or through the two high-level intake tunnels opening onto the cliff face above; nothing is said about precautions against poison gas, although presumably all shelterers would have had their gas masks with them. A system of baffles ensured that all tunnels were adequately ventilated (and would have been chilly on a cold winter day). The electrically driven ventilation fan, at the base of the shaft, also had an auxiliary petrol engine as an emergency backup. This could move 6,500 cubic feet of air per minute.



Female toilet cubicles on the east side of the first cross passage

We are not told but can presumably assume that mains electricity was brought into the shelter. Nor is emergency lighting mentioned, although the notion of 1500 people panicking in a confined space in total darkness is thought-provoking. No 'shelter rules' have been reported, but presumably there was a general expectation that people would arrive if at all possible with identity cards, hand torches, gas masks, perhaps ration books (if the canteen offered anything so sustaining as cheese rolls), and sandwiches.

After the 'phoney war' of 1939–40 we experienced the Battle of Britain, 1940–41, which gave an air of urgency to shelter construction. Shelter spaces were much in demand again with the advent of the V1 'doodlebugs' or flying bombs in the summer of 1944, and the V2 rockets of 1944–45.

Two photographs accompanied the newspaper article, and have been republished recently (Fookes, 2012). Captioned 'New bombproof deep shelter' they show the main entrance, and rows of two-tier wooden-framed bunks down both sides of a brick-lined tunnel.

OTHER SURREY COUNTY COUNCIL DEEP SHELTER PROPOSALS

An idea for deep shelters created by extending London Underground Northern line tunnels in the Merton & Morden district appears not to have been followed up.

In May 1941 the Eastern Emergency Committee considered that in view of the severity of air-raid damage, the accommodation provided by the deep shelters, when completed, would be 'quite inadequate' and noted that the Chislehurst 'caves' shelter (converted chalk mines in Kent to the southeast of London), with spaces for 10,000 shelterers, was already 'full to capacity'. The SWEC minutes also refer to suggestions that pre-existing 'caves' (in fact hearthstone mines and/or underground building-stone quarries) at Betchworth and Godstone might be used as shelters.

A 1939 local proposal for Godstone

As early as February 1939 one of the district councils in Surrey, that for Caterham & Warlingham, was considering the need for air-raid shelters, and the possibility of converting mine and quarry tunnels at Godstone (the next parish to the south along the main A22 road to Eastbourne) for that purpose. The tunnels at Godstone Hill are just over a mile south of Caterham station.

There are seven or more underground quarry-cum-mine systems tunnelled into the Upper Greensand either side of Godstone Hill (A22) to the north of Godstone village. In some cases what commenced as separate underground exploitations became interconnected underground. They have been worked since at least as early as the sixteenth century as building-stone quarries and as a source of refractory stone slabs for use as hearths and in ovens and furnaces. From about the 1820s or 1830s they were

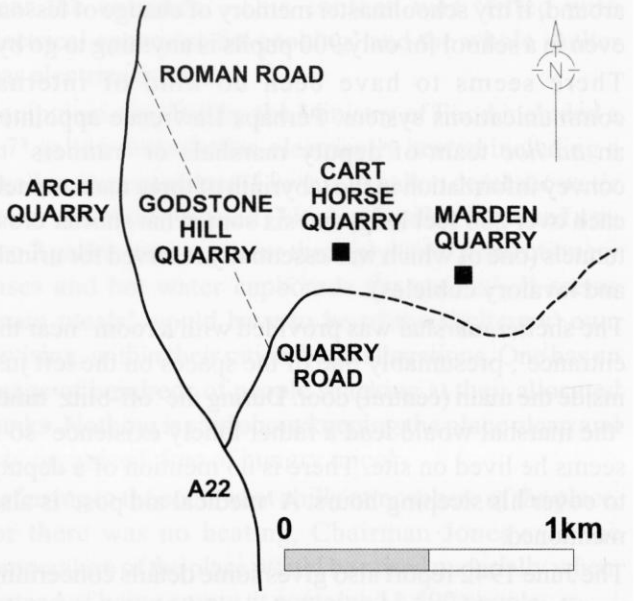
mined (as later at Betchworth) for the mineral pigment hearthstone, and used into the twentieth century as subterranean mushroom farms. Malcolm Tadd (1991) has described some aspects of this enterprise at Godstone.

On 25 February 1939 the *Daily Telegraph* reported as follows:

> A scheme to construct an evacuation camp to house some thousands of Londoners in time of war at Godstone, Surrey, with underground shelters in the neighbouring Godstone Caves has been submitted to the Home Office by the Caterham ARP Committee. Godstone quarries, known locally as the caves, consist of a labyrinth of underground galleries, from which, at one time, the famous greystone, used in some of London's oldest buildings, was quarried. The subterraneous passages, which are thought to be about eight miles in length, are from 80 to 200 ft. below the surface. They are now being explored and charted.
>
> A plan of the passages known to exist is already in the hands of the Home Office. Several underground springs have also been found, and the water has been analysed and passed as fit for drinking.
>
> Four entrances to the caves exist, and the exits from the camp will be built near them. So far no other entrances have been found, but there is a local legend that an entrance exists in Caterham, over 1˚ miles from Godstone.
>
> The caves are covered with trees, which would make a perfect natural camouflage against aircraft, and experts consider that the caves would provide complete protection against the heaviest bombs known.
>
> Major E.H. Impey, ARP Officer for Caterham, said last night: 'Home Office experts have already inspected the caves. They are keenly interested in our scheme, and are giving it their very careful consideration. We are hard at work trying to locate further entrances.'

Almost the only reliable information in this report concerns the tree cover! Internal evidence makes it clear that the tunnel network Major Impey had in mind was that generally referred to as the 'Godstone Hill' or 'Main Series' quarries. The four identified entrances were at TQ 348536 on the west side of the A22, TQ 239534 (now buried as a result of the road being widened since 1939), TQ 351535 on the east side of the Roman road, and TQ 351536, now blocked near the northwest corner of a warehouse in Quarry Road. The major appears to have ignored, or not known about, the extensive 'Arch' underground quarry west of the main road, and 'Carthorse' and 'Marden' quarries further east.

The springs certainly exist, and are almost constantly flowing (and keeping the northern end of the complex flooded), although usually yielding only a miserable trickle of water which, however potable, would have been quite insufficient to meet the needs of even a handful of persons. The 'legend' of an entrance to the 'caves' at Caterham (presumably meaning the Caterham-in-the-Valley town centre near the railway station, not Caterham-on-the-Hill, the original village centre) is laughable. The quarry tunnels run in for about 300 yards, not a mile and a half!



Location of 'Godstone Caves' (actually disused mine and quarry tunnels) either side of Godstone hill, part of the A22 between Godstone village and the town centre and station at Caterham-in-the-Valley. Surrey County Council spent about £600 in 1941 investigating tunnels each side of and below the main road with a view to converting parts of them into deep shelter accommodation for at least 10,000 persons, but this project was never proceeded with. In 1941 there was relatively convenient access to Arch quarry (west of the main road) and Godstone Hill quarry on the west side of the Roman road which the main road by-passed in or about 1870. Quarry Road is also shown, as is its continuation eastwards as a track passing several further tunnel systems. Of those, Carthorse and Marden quarries were used for storage during World War II but not as shelters. Altogether four extensive tunnel systems, all protected by locked gates and the like, are currently accessible here by liaison with the Wealden Cave and Mine Society, besides which there are several smaller lengths of tunnel. Since 1941 the M25 motorway has been built east-west to the south of this map extract, between the 'caves' and Godstone village. The nearest railway stations are at Caterham (about two kilometres to the north) and at South Godstone (about five kilometres to the south)

Very simple considerations of the thickness and inclination (downwards to the north) of the Upper Greensand beds in which the quarry tunnels were worked make it clear that this bed of rock is to be expected around 400 feet down at Caterham, below sea level, and below the local water table. The Caterham Model Laundry's well at nearby 60 Croydon Road had before 1939 penetrated the top four feet of the Upper Greensand at a depth of 394 feet, having encountered the water table

326 feet down. Any tunnelling here would have been a major engineering undertaking, possible only with continuous pumping! And Major Impey appears not to have considered the logistics of shelterers descending stairs to a depth of 400 feet every time an air-raid alert was sounded! So far as I am aware, no evacuation camp was ever built here, and certainly nothing came of this shelter scheme.

Two of the tunnel systems, east of the A22, were used as storage spaces during World War II. Both Carthorse quarry (TQ 35205370) and Marden quarry/mine (TQ 35705347) were used at that time for wines and spirits storage, and the latter also by the British Museum (Natural History) as a safe place for biological specimens preserved in formaldehyde, alcohol or the like. Relics of these wartime uses can still be seen underground.

Although already in 1939 considered by a local council, and evidently dismissed, the County Council gave the Godstone 'caves' their attention in 1941. Presumably unaware of the previous investigation, on 5 June that year the Chairman and Vice-Chairman of SWEC reported on the possible conversion of 'caves' at Godstone, the property of Sir Peter Greenwell, for shelter purposes and/or the storage of food and unspecified 'other purposes'. It had been decided to seek Ministry approval for the conversion, and to approach Sir Peter's agent, a Col. McClintock, with a view to reserving the 'caves' for the use of the County Council. The Ministry appears not to have remembered the earlier project.

On 18 June 1941 Robinson reported that the Godstone 'caves' consisted of two separate series, the first known as 'Arch' and the second 'partly under the main road' on Godstone Hill (now the A22). These mine and quarry tunnels in the Upper Greensand have been described by the present author (Sowan, 1969 and 1976) and subsequently by other members of the Wealden Cave and Mine Society, most notably Peter Burgess (2008). Arch quarry is still accessible via a vertical shaft constructed through landfill power-station ash at TQ 347536. The Godstone Hill or Main Series tunnels had several entrances, representing formerly separate workings now interconnected underground.

A survey was made (drawing G 4735) which is not filed with the minutes. The Arch tunnels, it was reported, 'go straight in under very high ground and are perfectly dry'. Those to the east are 'partly under the main road' and 'more extensive' although 'a large proportion of them are under relatively shallow ground and are damp and waterlogged'.

Of Arch quarry it was reported that 'after a long narrow tunnel some 400 feet long has been traversed', the network of quarry tunnels was reached where, it was estimated, at least a mile of serviceable tunnel averaging about 20 feet wide with a headroom of six feet could be used as a shelter. With two bunks (presumably two-tier bunks) and allowing for people every six feet or so (along the length of tunnel), the system could accommodate some 4,224 people. Nothing is said about an emergency exit! This quarry does have a deep narrow air shaft at its inner end, but useless as an escape route.

The 'second series' partly under the road is described as having a much longer length of tunnels, but 'a large proportion of them are damp and unsuitable for shelters'. In fact the inner parts of the system are collapsed and often flooded. However, a serviceable one and a half miles of tunnel could accommodate 6,336 people, making a potential deep shelter provision for over 10,500 persons at Godstone Hill. An earlier estimate of space for 20,000 persons had evidently been scaled down.

The site is in open country between Godstone and Caterham, just over a mile uphill from Caterham Station. The next nearest railway station (called Godstone but in reality at South Godstone) is around three miles to the south of the tunnel complexes. Doubtless on account of the distance from Caterham station, the report notes that 'there is ample room for car parking which could be arranged among the existing trees. These would form a camouflage screen'. Those with a knowledge of Godstone Hill may struggle to envisage car parking sufficient for over 10,000 shelterers (even if sharing cars) 'amongst the trees'.

A typical quarry gallery at Godstone Hill. The iron plateway in the foreground has been laid with reused plate rails from the horse-drawn Croydon, Merstham & Godstone Iron Railway. The CMGIR although authorised by its Act of Parliament to be built to Reigate with a branch to Godstone Green, was in fact only constructed and opened for traffic as far as Merstham in 1805. The intended Godstone terminus would have been to the south of the village, about two kilometres south of the quarries at Godstone Hill. The walls are thought to have been whitewashed by mushroom farmers who used the quarry in the late 19th and / or early 20th centuries.

Perhaps somewhat more realistically, Robinson noted that 'there is an eight-inch water main in the main road' and another nearby in the old Roman road. The nearest sewer (six inches diameter) was about a thousand yards away. A high-tension electricity cable existed at the time along the Roman road (where there is access

underground) where a transformer and switch gear would be needed for a supply to the 'caves', although no such cable is noted from which the Arch tunnels might have been supplied.

In October 1941 the County Engineer reported that the Ministry of Aircraft Production had intimated that they 'have no use for the caves' at Godstone, and that the Board of Trade 'have now inspected the caves and are now giving consideration to the matter'. Neither department appears to have shown any further interest in the mine and quarry tunnels at Godstone. However, some mine tunnels at Godstone were in fact used for wartime secure storage for wines and spirits, and Natural History Museum specimens in bottles of preservative fluids, these uses not being the concern of the County Council. Silver-sand mines and rock-cut cellars at, for example, Dorking and Reigate were certainly used as shelters, but these appear to have been initiatives at local level, not managed from County Hall. The services of James Geary Gardner, operator of the Chislehurst 'caves' deep shelter (a converted chalk mine), were engaged in a consultancy capacity.

Nothing (for a second time) came of the Godstone proposals. On 29 July 1941 it was reported to the SWEC that the work would not be approved by the Ministry. Work on this scheme was to be discontinued, and all further expenditure on it stopped. It had cost altogether about £600.

Ironically, during the Cold War era many years later, the Emergency Planning Officer for Surrey approached the author of this article for information on the Godstone and other Surrey mine and quarry tunnels with a view to their use as shelters in the event of nuclear war. It was pointed out that the Godstone 'caves' had twice already been officially considered as places to shelter from conventional high-explosive bombs, and twice dismissed as unsuitable!

Other east Surrey mines: White Hill quarry and Betchworth hearthstone mine

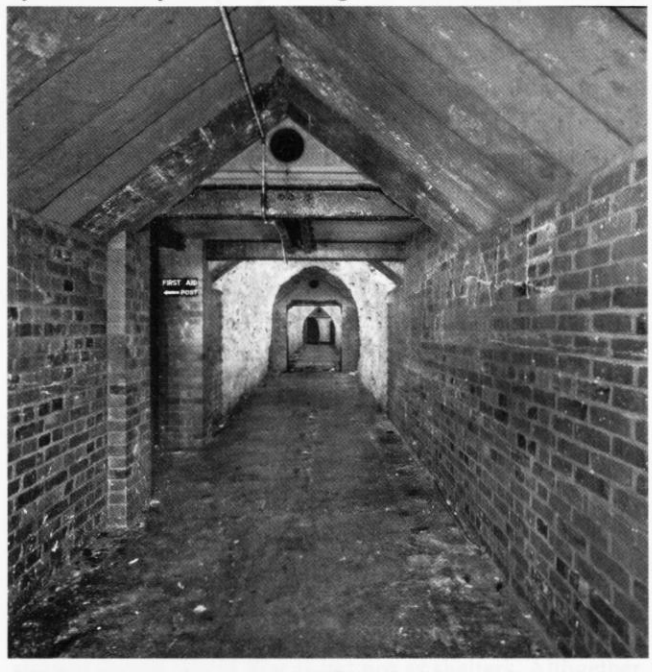
Robinson was authorised to spend £30 on investigating another possibly suitable site at White Hill (TQ 3253) around two miles east of Merstham station and remote from any main road, where another underground quarry in the Upper Greensand is known to exist (but appears not to have been visited within living memory). It is around two miles north of what is now the A25 through Bletchingley village. Nothing further is heard of this option. There has been no access to any considerable length of quarry tunnel here since the war, so far as is known.

The hearthstone mine operated by the Dorking Greystone Lime Co Ltd at and below their lime works (TQ 20855140) at Betchworth was still in operation when war broke out, and indeed continued production after the war on a small scale until the early 1950s. The mine had three tunnelled entrances leading in from the floor of an open pit (to the east of the lime kilns) which has now been backfilled.

Hearthstone, a mineral pigment used to whiten natural stone surfaces such as hearths, was mined from the Upper Greensand beds at several places, most extensively at Brockham, Betchworth, Reigate and Godstone between the 1820s and 1960 at about which time the last operating mine in Surrey (Colley Hill) closed. Neither the SWEC minutes nor the voluminous archive of the lime company make any mention of this shelter option being progressed.

The Foxenden shelter at Guildford

This shelter tunnelled into chalk at a disused pit near Foxenden Road (and London Road station) in central Guildford was a Guildford Borough project, not managed by the County Council. However, it is mentioned once or twice in the SWEC minutes as a result of its being used by the County for food storage.



Foxenden shelter in 2001

An underground quarry for hard chalk for use as a building-stone, already in existence in the eighteenth century, appears (oddly) not to have been considered or used as a shelter. It is tunnelled into a chalk pit face in Quarry Street, south of the castle.

OTHER SURREY DEEP SHELTER PROPOSALS

Dorking

Central Dorking, like Reigate, stands on the outcrop of the Folkestone Sand. Whilst there are no extensive industrial-scale mines in the town, there are numerous rock-cut cellars. Mentions in contemporary local newspapers of the use of some of these as shelters have been published (Knight, 1989). Knight compiled and published extracts of wartime news from the *Dorking Advertiser* which reveal that from as early as 1938 there

was interest in the town in the creation of new tunnelled deep shelters.

As early as 14 January 1938 the Vicar of St. Paul's Church, Dorking, was quoted in the *Dorking Advertiser* as suggesting that bomb-proof 'tube shelters' should be provided 'throughout the town'. And on 7 April 1939 the same newspaper reported that: 'A section of the Dorking public has been urging that bomb-proof shelters should be constructed in or near the town. Some suggested that tunnels should be pierced into the hillside of Cotmandene and the Nower, while others think that the caves near High Street should be converted into shelters. The Government, advised by experts having full knowledge of the likelihood of bombs and of the possibilities of protection, have not given support to the construction of deep shelters.'

No such tunnelled shelters were in fact made, although a number of existing rock-cut cellars in the town centre were used. Had new tunnel shelters been excavated, they would have yielded more than enough sand for as many sandbags as were wanted to protect surface buildings, as Dorking town centre is, like Reigate, on the Folkestone Sand outcrop. In fact quantities of sand for this purpose were dug at open pits around Dorking in 1940, such as at Vincent Lane and alongside the new Dorking bypass. The local paper noted that 'Men offering to do sandbag filling should if possible bring their own shovels. Sandbag filling is good healthy exercise'. Noted composer Ralph Vaughan Williams [1872–1958], who lived locally, set a good example by taking a turn at this task.

In October and November 1940 persons at Westcott, just west of the town centre, urged tunnelling for shelters.

> A well attended meeting was held in the Hut, Westcott, on Saturday to discuss ... the provision of air-raid shelters in the village ... During the discussion which arose, many criticisms were made of the inadequacy of surface shelters, and speakers expressed the opinion that there was a need for those of the underground type. Suggestions were made on the possibility of digging into the surrounding hillsides to provide shelters.

This was considered by the Air Raid Precautions (ARP) Committee of the Dorking Urban District Council in November, when proposals were put forward that 'the area being particularly suitable for tunnelling', advantage should be taken of the natural features of the countryside to provide what would be really safe shelter.

In December 1940 the Council considered the possibility of 'caves' as air-raid shelters. The Surveyor reported to the ARP Committee that he had inspected a considerable number of caves in Dorking. With one exception, he considered them to be unsuitable for adaptation as public shelters. The exception was the cave at the rear of the premises of Messrs B. Turner, Ltd, in the High Street. The Committee inspected the cave and then decided to ask for an inspection by the Regional Technical Adviser with a view to approval.

At a subsequent ARP Committee meeting, the Surveyor presented plans for the adaptation of the cave at the rear of Messrs Turner's premises at a cost of about £750. The cave would accommodate 420 persons, or, if three-tier bunks were fitted, bunks for 200 persons and seating accommodation for about 100 persons.

The ARP Committee recommended the Emergency Committee to authorise the Surveyor to proceed with the proposal, including the provision of bunks. Miss Evans (Councillor) inquired whether any steps had been taken to find out whether the cave shelter would be utilised. At present it was a most eerie place and it was doubtful if it would be much used. The Chairman: 'It will look very different when it is fitted up'.

Mr Somner said the Regional authorities had agreed that the cave had possibilities as a shelter. No claim was made that it was bombproof. In any case, the Council would have no power to go ahead with the scheme unless it was approved by the Regional Technical Advisors. The Council would not work on the lines of whether the shelter would be used or not. The appearance of the cave would be changed entirely when it had electric lights, seating, roof supports and some flooring. He thought the shelter would be used.

The Surveyor reported on a Home Security circular regarding tunnelling. After consideration, the Committee was satisfied that nowhere in the district where a tunnelling scheme was *prima facie* justifiable would it be possible in view of the Ministry's stringent requirements.

The Surveyor stated that he had obtained an estimate for steel-framed, wire-mattressed double bunks, at 55 shillings each, or 50s. each if 200 were ordered. The ARP Committee sought approval for the fitting of bunks in all suitable existing shelters and in any future shelters provided in the district.

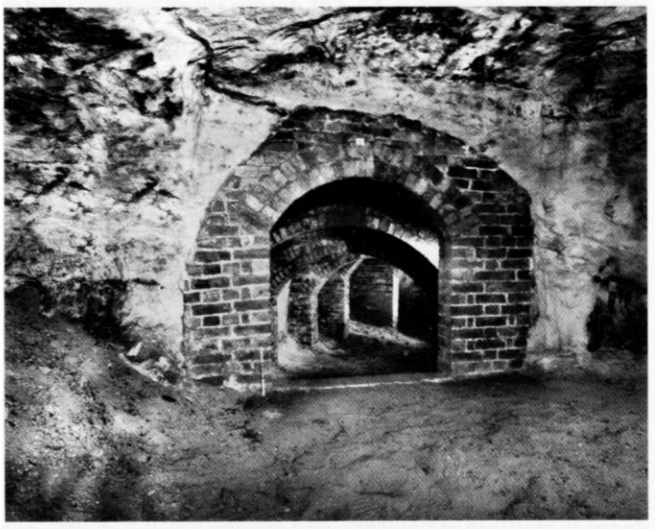
Subject to Regional approval, 150 two-tier steel tubular bunks costing 41s. each are to be bought for public shelters. The Surveyor was asked to inquire regarding the provision of low-voltage wall heaters for public shelters.

Reigate 'caves'

A number of other schemes, all for the reuse of existing underground space, were undertaken by at least some of the local councils, apparently quite independently of the County administration. At Reigate, for example, there are extensive sand mines in the town centre (described in *Subterranea* 32.

Reigate Borough Council had as early as 1939 produced a plan for the wartime use of the 'caves' communicating with either side of Tunnel Road. The annotations indicating prospective uses for the various parts of the two systems show that both shelter accommodation and

an emergency control centre (conveniently close to the nearby Town Hall in Castlefield Road) were in prospect.



Tunnel at the north end of the Tunnel Road East sand mine at Reigate. The brick support arches at this point of the mine may have been inserted on account of the Borough of Reigate's new town hall being built nearby at the surface in or about 1902

Whether or not the spaces were used as suggested is not entirely clear. But there is no doubt that they were used during the war, as lavatories and sewerage were installed, internal partition walls erected, and emergency escape exits created. And in recent years a number of persons taking guided tours led by members of the Wealden Cave and Mine Society have recalled sleeping here during air raids. The two interlinked Reigate Lodge sand mines, also, were used as a shelter by the then Reigate Grammar School for Girls.

There are also other smaller mines and numerous rock-cut cellars in the town, most of them at the rear of premises along the north side of Reigate High Street and the east side of London Road. A number of these, also, are known to have been used as wartime shelters.

CONCLUSIONS

The Surrey County Council deep-shelter programme was less than a resounding success. On time and on budget it was not! One shelter had to be abandoned unfinished, and another completed with less than half the intended capacity. And the final cost greatly exceeded the initial estimate.

Arguments about how much of the excess expenditure would be reimbursed by central government rumbled on to the end of the war, resulting in an unwelcome addition to the rate charge for the county of £17,267, a considerable sum in 1945. Of all four completed shelters only that at Riddlesdown was anything like fit for purpose: the others suffered grossly from damp, condensation, and water penetration through their roofs, resulting in rotting timber-framed and hessian bunks rapidly becoming unusable.

Curiously, proposals abandoned in 1939 that Godstone 'caves' might serve as shelters had been forgotten by 1941 when these places were (at some cost) considered again for the same purpose, and the same again in the Cold War. Joined-up thinking was notable by its absence!

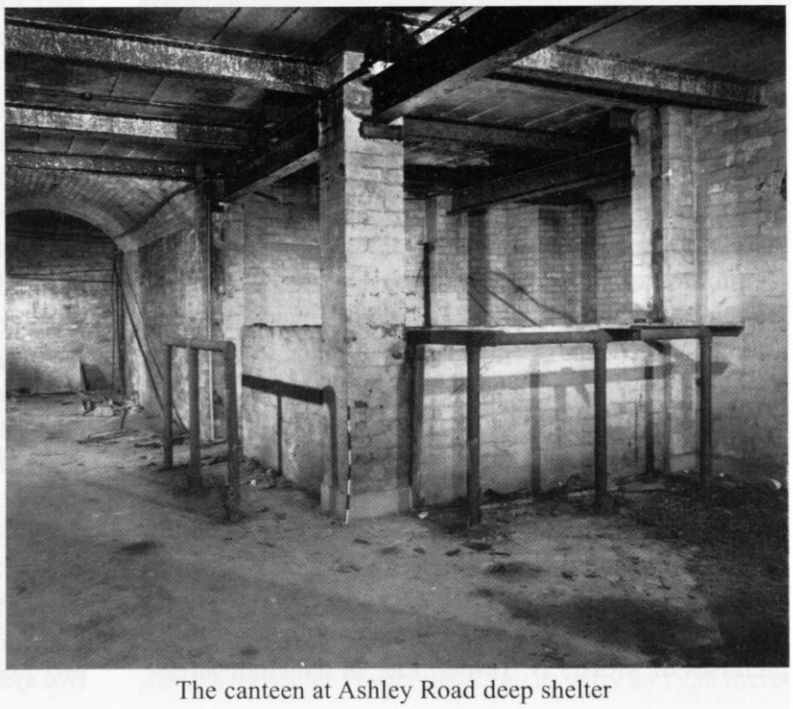
The notion of World War II bolt-holes for civil servants can be added to the catalogue of east Surrey's 'rural myths', leaving the photographs of Berlin found in the Brighton Road shelter unexplained, although of course a company manufacturing precision lenses and the like provides an obvious link with specialised cameras and photography. Of the same status are assertions that at Godstone Road, cardboard coffins were stored in readiness for Cold War use, and there was a tunnel connection to the nearby Riddlesdown railway tunnel.

FINALLY

It is a pleasurable duty to acknowledge the invaluable early contributions of Harry Pearman and Brian Hillman to the study of the Surrey deep shelters. It was with Brian Hillman that I first visited the Brighton Road shelter. Some points of detail have also been discussed with Nick Catford and Chris Rayner. Nick Catford has added to this article a number of plans and photographs – all photos by Nick Catford unless stated. Staff at the Surrey History Centre at Woking, and the LB Croydon Local Studies Library and Archive Services are thanked for their assistance.

Access underground to the deep-shelter sites is currently either not possible, or not encouraged. Access to several of the Godstone area mines and quarries can be arranged with the Wealden Cave and Mine Society.

Sources have been published on the Sub-Brit website at www.subbrit.org.uk/sb-sites/sites/s/surreyshelters/index.shtml



The canteen at Ashley Road deep shelter

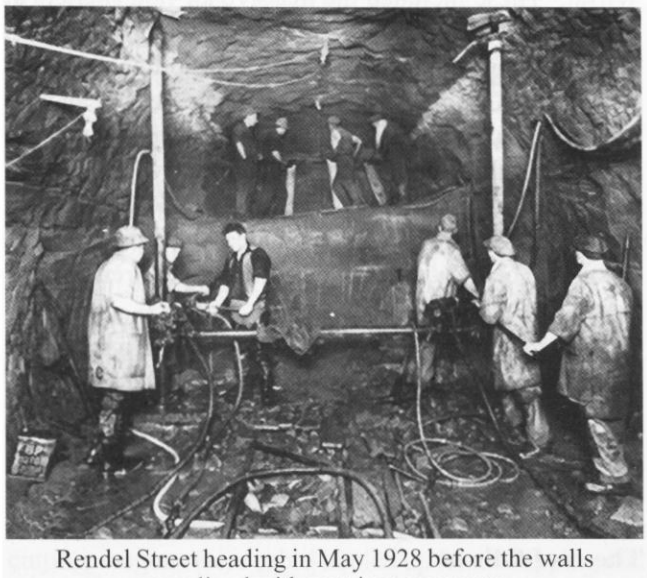
Sub Brit's weekend in Liverpool

Martin Dixon, Chris Rayner, Nick Catford & FoWT

Recognising that Sub Brit has members across the UK (and beyond), we've had our Autumn Meeting in various locations. In October 2012 we trialled a new format with a day of talks, many with a local flavour, followed by a packed day of visits. The location for this new format was Liverpool, thanks to hard work by Chris Rayner, aided and abetted by the Friends of Williamson's Tunnels.

Queensway Tunnel

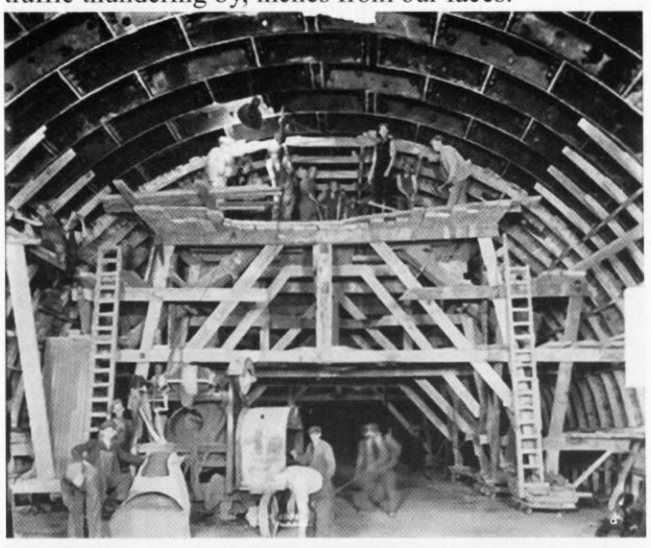
For those of us who could make it on the Friday, the weekend began with a guided visit to Queensway Tunnel, one of two road tunnels beneath the Mersey. We assembled in the headquarters building which also doubles as a ventilation shaft. The building is Art Deco inspired and Grade II listed – it looks more like a Town Hall or even a Cenotaph with its fine lines. Ironically Chris Rayner was stuck the wrong side of the Pennines due to a road closure and so sadly missed the start of his own weekend.



Rendel Street heading in May 1928 before the walls were lined with cast-iron segments.
Photo from Mersey Maritime Museum

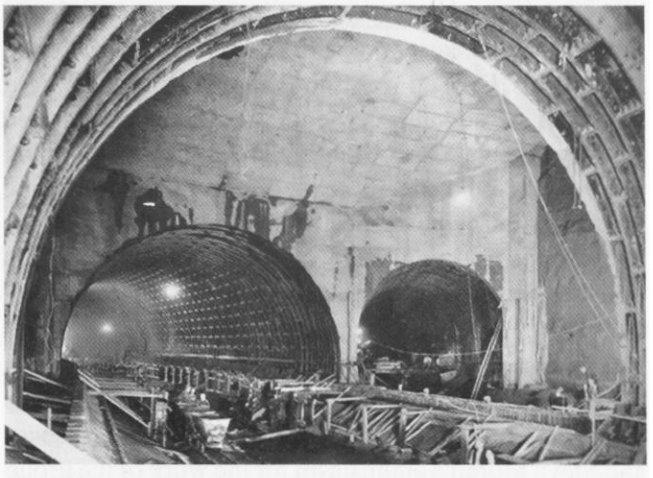
After a safety briefing we set off to the control room which operates 24/7. Closed-circuit television, fire detection and ventilation control all come together here and we were given a potted history of the tunnel. It was built between 1925 and 1934 and its enormous single bore at a whisker over two miles long was for 24 years the longest underwater tunnel in the world. It has two underground junctions once controlled with underground traffic lights, although today only one branch is partially used. Around 1,700 men were involved in the construction and sadly seventeen of them lost their lives.

Then the visit proper began and we descended to tunnel level. Our first stop was by one of the huge vertical ventilation fans which dates from the original design. Right on cue and like something from an *Indiana Jones* film, the giant doors opened and the fan began turning. The control room staff were certainly playing to the gallery, which we appreciated. We were then able in small groups to step out through a doorway and view the rush-hour traffic thundering by, inches from our faces.



The under-river portion of the tunnel in 1931, with an internal diameter of 44 feet. This section of the tunnel was completely circular and due to its immense size, the top half of the tunnel was excavated first, lined and then work began on the lower half. After the main lining and concrete roadway had been completed, the cast-iron segments above the roadway level were filled with concrete; which is the process being undertaken here. Photo from Mersey Maritime Museum

A fascinating excursion below the road deck followed. When originally constructed the plan was for this lower level to be laid with tram tracks to provide additional passenger capacity across the River Mersey. Although the plan never came to fruition, the space is an important part of the forced ventilation system which enters into the road tunnel proper at carriageway level. The movement of air was very noticeable and fortunately we were in the clean air flow rather than the extract.



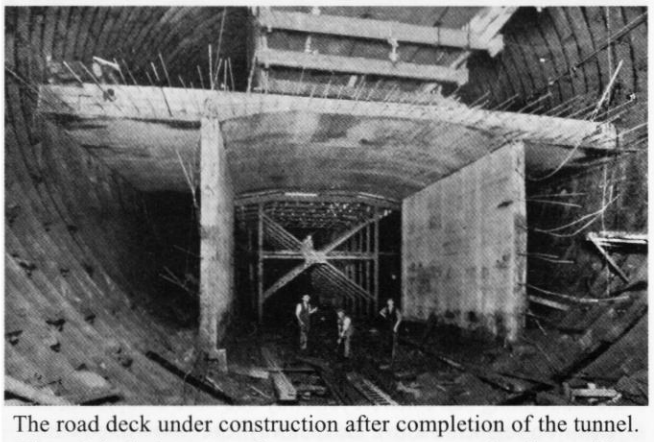
The Rendel Street junction chamber under construction in the 1930s. The Rendel Street branch seen on the right was closed in 1965. The main tunnel ahead goes to Birkenhead.

Recent additions to this lower level are seven safe refuges for evacuation purposes in case of a major incident or fire. These were installed after tunnel tragedies on the

continent and offer a haven with water, fire protection and basic toilets. Each shelter can accommodate 180 people and they are accessed from stairways leading down from the road deck.

We concluded the visit with a look at more recent ventilation equipment – this time horizontal fans that were rail-mounted with a standby fan being automatically moved into place from right-angled 'sidings'. These units could also be craned out to the surface for major overhaul.

All in all this was a fascinating visit which Mersey Tunnels offers on a regular basis to the public. It is pleasing to see a utility company showcasing its achievements rather than hiding their fine work behind locked doors.



The road deck under construction after completion of the tunnel. The original plans were for a tramway to run under the road but this never materialised. Extra pillars have since been built to support increasing traffic weight.

From the Queensway tunnel many members decided to sample Liverpool's nightlife before eventually making their way to the Devonshire House Hotel which was not only our accommodation for the night, but also the venue for Saturday's conference.

The weekend was fully booked – I like to think that is because of the high quality of the speakers as well as the high quality of the Sunday site visits.

The Saturday conference

Of the four speakers booked for the day, three spoke on local topics. First up was Sub Brit member Paul Wright who told us about Liverpool's numerous abandoned railway tunnels. One of these, the 2,220-yard Wapping Tunnel was to be one of the highlights on the following day. Paul is a well respected railway author with an encyclopaedic knowledge of local railways and his polished performance was well received by the capacity audience.

Next were our hosts for the weekend, our good friends from the Friends of Williamson's Tunnels. The Friends have spoken at a number of past Sub Brit conferences and Steve Moran's enthusiasm for the work of the group is infectious.

He related the bizarre tale of one man's obsession with tunnelling two centuries ago and the story of their ongoing rediscovery. The Friends currently have access to two sites – Joseph Williamson's House with its impressive underground banqueting hall in Mason Street, and the three-level basement below the now-demolished building at no. 1 Paddington. Both of these sites were on the programme for visits on Sunday.

From Bath to Corsham

Our third speaker was Derek Hawkins who is one of the leading authorities on the Bath Stone Quarries. In 1982 he was employed as a quarryman at Limpley Stoke before moving to Monks Park in 1984. In 1986 he transferred to Monkton Farleigh working with Nick McCamley at the (then) recently opened museum at the former WWII ammunition depot. Since 1992 he has worked for the MoD being employed as Quarry Safety Officer at Spring/Tunnel Quarry in Corsham. Derek has recently published *Bath Stone Quarries,* a superb photographic record covering a lifetime working and exploring underground. His photography is superb and his presentation was very well received.

Our final speaker was Gavin Hunter who took us across the Mersey for a roving tour of underground sites on the Wirral. These included the massive air-raid shelters at Tranmere and the now-demolished Glenda Jackson Theatre which had the Wirral Metropolitan Borough Emergency Centre hidden deep in its bowels. I can well remember a day back in 2001 when we visited the theatre, climbing up onto the roof and activating the air-raid siren (with permission from the Liverpool Emergency Planning Officer who was our guide), albeit for only five seconds. The theatre might be gone but the siren found a new home at Hack Green.

With the formal conference over, we were given instructions for the following day's visits by FoWT's Claire Moorhead who was responsible for the logistics of moving six small groups of people around the city on the same day as the Liverpool Marathon. I certainly didn't envy her job – to my surprise everything was to go pretty much to plan.

The roof falls in

One of the main sites arranged for the Sunday was Dingle station at the southern end of the Liverpool Overhead Railway. After having advertised the visit, which had been agreed with the owner, there was unfortunately a massive roof collapse on 24 July last year that left the tunnel unsafe and eleven families in the street above without a home – see *Subterranea* 31 (December 2012) – page 36. It was quickly made clear that our planned visit was now out of the question; even the owner wasn't allowed in.

Event organiser Chris Rayner had to find an alternative site at very short notice. The obvious choice was Wapping Tunnel where the FoWT had arranged for a party from Sub Brit to be driven through the tunnel at no charge to us as part of a publicity campaign for Land Rover Experience. Although this had been approved, we learnt as we got closer to the date that Land Rover's licence to use the tunnel had expired, and if they renewed it the full cost would be passed on to us which worked out at £35 per head.

Luckily the FoWT and Network Rail saved the day; having turned down our initial request to go into Wapping tunnel on foot, they had a change of mind agreeing to take small parties into the Edge Hill cutting and 100 metres into the Wapping tunnel. After a little persuasion they agreed to let us into Crown Street tunnel as well.

The Sub Brit party are seen walking through the Edge Hill cutting towards the tunnel portals. They are from right to left 1829 Crown Street tunnel, Wapping Tunnel and 1840s Crown Street Tunnel. A few weeks before this picture was taken it would have been impossible to see the tunnel mouths from this position. The thick undergrowth was cut down by Network Rail prior to our visit. Photo Chris Rayner

Crown Street and Wapping tunnels and the Edge Hill cutting

George Stephenson started work on the 31-mile-long Manchester and Liverpool Railway in 1826 with its Liverpool terminus at Crown Street. The line was to be locomotive-hauled from Manchester as far as the Edge Hill cutting where the locomotives would be detached; loaded coaches were then cable-hauled through a short tunnel by winding engines at the passenger terminus at Crown Street. Goods traffic was handled at the Wapping goods station close to Liverpool Docks. This was reached by an impressive 2,220-yard tunnel from the Edge Hill cutting; wagons were cable-hauled up from Wapping and descended by gravity.

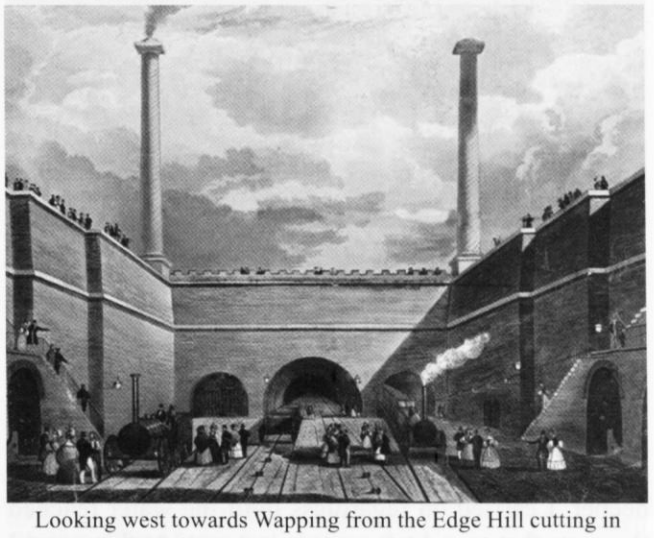
Having donned the regulation orange safety clothing, we assembled at an unmarked door on the south side of Tunnel Road, close to Edge Hill station. From there steps led down onto an area of waste land, the site of the former carriage-cleaning sheds. We walked under Tunnel Road entering the famous Edge Hill cutting. To our left a twin track remains in use running through the short 1840s Crown Street tunnel with a portal alongside that of the Wapping tunnel and George Stephenson's original Crown Street tunnel.

The deep Edge Hill cutting is rectangular in shape, bounded on three sides by vertical walls. As we walked through the cutting we could see numerous openings cut into the rock face on both sides. Those on the south side (the other side of the railway line) were all fenced but those on our side were open and we were able to look into some of them.

The openings served a number of different purposes. On the south side the two easternmost openings probably housed two of the boilers for the south engine inside the Moorish Arch. The bays are joined together at the rear by a short tunnel and there is also a link to the smoke flue feeding the southern chimney.

On the north side of the cutting the first two openings at the eastern end have no significant features to indicate their original use. The easternmost chamber may have been used as a locomotive coal store and the second chamber may have been used for staff accommodation, although latterly it has been used for storing sand.

The third opening was probably the site of the steam-heated water tank in conjunction with the adjacent coal store. The next pair of chambers to the west are the two boiler houses under the steps to the Moorish Arch. At the rear of the chambers a flue leads towards the northern chimney. The final pair of openings appears to be an enlargement of a smaller chamber that was referred to as a stable for the Crown Street pilot horse. It was later opened up to provide staff accommodation when the present rooms, which include windows and a doorway, were excavated.



Looking west towards Wapping from the Edge Hill cutting in 1831. The Wapping tunnel is seen straight ahead. Some wagons are heading to Wapping and the cables that worked them can be seen in the centre of the track. To the right a locomotive has just backed onto passenger coaches that would have worked down from Crown Street by gravity. Some of them are still in the Crown Street tunnel. To the left of the Wapping Tunnel carved into the rock is a locomotive shed. It would later be converted into a double-track tunnel leading to Crown Street. Painting by Thomas Bury

At the western end three tunnels enter the west wall of the cutting. The northernmost (the 'Stephenson' tunnel) to Crown Street and the central one to Wapping date from the opening of the line, while the southernmost tunnel was driven through an original storage recess in about 1846. This was further opened up when the wall of the south cutting was later cut back by three metres to accommodate an extra track.

The track is still used to allow locomotives to run around their trains. After closure in 1972, the 1840s tunnel was

reopened in the late 1980s to facilitate the movement of coal from the docks to Fiddlers Ferry Power Station. The tunnel is now hardly ever used as the reopening of the Olive Mount chord (bringing another disused tunnel into use) means that a reversal at Edge Hill is no longer necessary for most trains.

Keys open the way

The 1929 Crown Street tunnel and the Wapping tunnel were securely gated but our guide had the keys to both. We entered the Stephenson tunnel first; it is the smallest, being 5.15 metres high to the crown of the arch, and 4.60 metres wide. At the far end, which is now blocked, there is a date-stone of 1829 set into the roof. There is also a hole in the floor dropping down into the roof of the Wapping Tunnel. The tunnel is cut through solid rock and unlined; it is in good condition with a large number of long stalactites hanging from the roof.

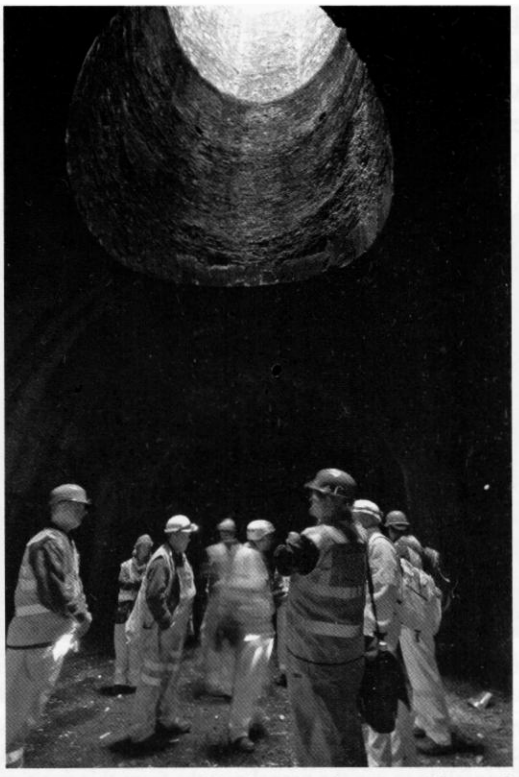
The west portal of the 1829 Crown Street tunnel has been buried and the site of the former Crown Street station is now a landscaped park. This is a view of the backfilled west end of the tunnel. Photo Nick Catford

Having retraced our steps, we entered the Wapping tunnel. It is no longer possible to walk all the way through. I tried in 1998 but a couple of hundred yards from the west portal I encountered water which got progressively deeper. I carried on regardless until the water reached the parts that you don't want to get wet. At this point I turned round and walked back.

Our guide said we could walk about 100 metres into the tunnel. The Wapping tunnel entrance is 5.60 metres high and 7.05 metres wide and considering its length it was a very ambitious project for 1830. Like the Crown Street tunnel, the Wapping one is also cut through solid rock with brick arching. We could see light in the distance from the first of five ventilation shafts in an area of landscaped parkland between Crown Street and Smithdown Lane. We walked as far as the ventilation shaft and then a bit further.

Friends in high places

Getting into the west end of the tunnel was somewhat easier to arrange as it didn't require permission from Network Rail. Luckily the FoWT had friends in the City Council and there was no problem borrowing a key to the gate with one of the Friends acting as our guide.



The Sub Brit party stand in the Wapping Tunnel beneath the Crown Street ventilation shaft. Photo Chris Rayner

Construction of the Wapping tunnel started in 1826 and with the opening of Wapping goods station in 1830, goods traffic was now able to reach Manchester from the Liverpool docks. The sidings stretched back about 200 yards from the tunnel mouth towards the dock, with warehouses above the railway lines on both sides from where goods could be loaded directly onto the wagons below.

This short cutting was created when the eastern end of the Wapping Tunnel was opened up between Park Lane and Upper Frederick Street in 1896. From this cutting two new tunnels were driven into the expanded goods depot. The original tunnel is seen in the centre with the two new tunnels either side. Photo Nick Catford

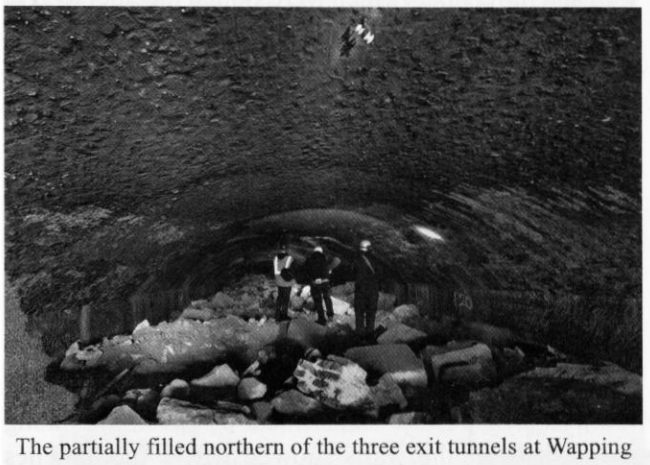
At the end of the nineteenth century the goods depot was expanded several times and in 1896 a short section of the tunnel was opened out 100 yards east of the portal between Park Lane and Upper Frederick Street and a new western portal was built. From this open section two new tunnels were driven under Park Lane and

Jamaica Street into the expanded goods depot on either side of the original tunnel.

By this date the goods depot was known as Park Lane and Wapping (and from 10 February 1923 just Park Lane). It was heavily bombed by the Luftwaffe in 1940 and rebuilt in the 1950s, finally closing in November 1965. The track was quickly lifted and the area has now been redeveloped. British Railways retained the east end of the tunnel but the rest of it was sold to Liverpool Corporation in 1967. Ownership of the tunnel remains the same today.

Our entry point into the tunnel was through the original western portal at the end of Kings Dock Street. The tunnel had been cleared of debris to allow Jaguar Land Rover to show off their new Halewood-built *Evoque* using Wapping Tunnel as part of a rough-terrain test-drive route to impress journalists.

We walked through the short tunnel to the section that was opened out in 1896. Straight ahead of us was a steep mound of earth and it was clear that the Land Rovers had driven over the top of this and down the other side and back into the tunnel through the new 1896 west portal. As we climbed up to the top of the mound we turned round to see the other two tunnels either side of the middle tunnel that we had just walked along.

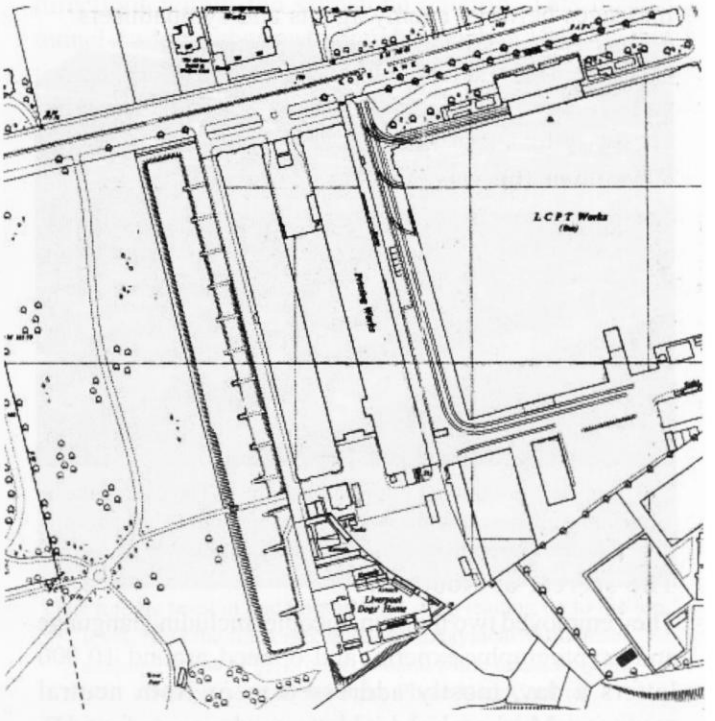


The partially filled northern of the three exit tunnels at Wapping goods station. Photo Chris Rayner

Both of these tunnels are partially backfilled but this proved no obstacle to many in the group who clambered over rubble to reach the bricked-up portals at the far end. Moving back into the Wapping tunnel, we were able to walk on backfill for a hundred yards until we reached the water. It was clear that the Land Rovers had driven on but it was time for us to turn back and move on to the next site. As we were turning back we were convinced we could see lights in the distance; this must have been one of the other parties in the tunnel but no amount of shouting brought any response. We retraced our steps to Kings Dock Street.

For more on the history of the Wapping and Crown Street tunnels see Paul Wright's feature *Merseyside's Disused Railway Tunnels* on page 20 of this issue of *Subterranea*.

Edge Hill Air-Raid Shelter



A 1950s 1:2,500 OS map clearly shows the shelter with 13 entrances adjacent to the Littlewoods building.

The air-raid shelter in the northeast corner of Wavertree Park has been sealed for nine years; however, after some lengthy negotiations by the Friends of Williamson's Tunnels on our behalf, permission was granted for it to be opened up for our Sunday visit and it was then resealed by FoWT afterwards.

The imposing Littlewoods building stands at one of Liverpool's highest points, and dominates the main Edge Lane approach to the city centre. In its heyday, thousands of mainly female workers printed and checked Littlewoods football pools coupons delivered by an army of agents to every street in the country.

The building's tall central clock tower and streamlined white concrete profile are visible across the city's eastern suburbs, and the bright stucco concrete was described as 'outdazzling' contemporary industrial buildings in Pevsner's architectural guides. It is associated with one of Britain's most famous philanthropic families, the Moores brothers, who built Littlewoods into the country's biggest family-owned firm.

The Littlewoods building was completed in 1938, and was probably designed by Scottish architect Gerald de Courcy Fraser, who also designed a number of fine department stores for Lewis's and others.

At the start of WWII the Football League was suspended and the newly opened factory was given a new role as part of the war effort; the building's mighty printing presses were immediately used to print 17 million National Registration forms, wartime identity cards, in just three days. Subsequently MC5, the Government's postal censorship centre (known by its workers as "the

Censorship") was based here and searched for coded messages between enemy agents and sympathisers.

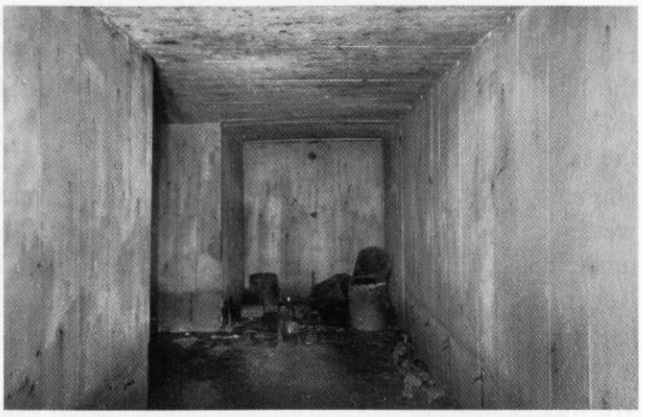
The upper floor of the Littlewood buildings. The date of the picture isn't known so the women seen here might have been checking pools or censoring letters during WWII

The secrets of Room 99

They employed two thousand people, including language and cryptography experts, and opened around 10,000 letters a day, mostly addressed to or from neutral countries. Maybe a hundred letters a day were found to be suspicious, either containing overt propaganda or something more sinister. These were sent to Room 99 where chemists and others looked for invisible ink and codes. Diplomatic and Consular mail was also secretly opened here, completely illegally, by 'Steam Kettle Bill'.

Other parts of the factory were used for the production of barrage balloons and parachutes. With such a large workforce a large underground shelter was built for the workers on land adjacent to the building. Merseyside was the second most heavily bombed part of Britain after London, and air-raid shelters would have seen a great deal of use during alerts and raids.

The Littlewoods shelter is approximately 300m long, aligned on a northerly axis parallel to the Littlewoods building. In plan it resembles a chain of rectangles (with pairs of shelter chambers roughly 12m and 9m long along the four sides) joined by 9m-long corridor galleries. It had 13 entrances evenly disposed along its length to facilitate filling from the west side of the factory – these sloping entrance passages joined the connecting corridor galleries at right angles, giving excellent blast protection.



A pair of toilet cubicles were located in the alcove. The remains of four Elsan chemical toilets are seen here. Photo Nick Catford

The shelter was semi-buried using a cut-and-cover method with earth banked on top of it for bomb splinter protection. It may have begun as a Munich-crisis trench rapidly dug during the tense weeks of September 1938. Many of these were then lined with precast-concrete wall and roof panels which were slotted together to give a degree of dryness and an illusion of permanence. Littlewoods' shelter though is built with much stronger reinforced concrete, and the clean timber board marks indicate higher quality and more expensive construction than normal.

The opening made by the Friends of Williamson's Tunnels required a short slide down an old debris slope into the shelter. The air quality had been checked by FoWT and apart from one cordoned-off leg the whole shelter was accessible.

Signage was limited to black stencilled bay numbers and 'Turn Right and Duck' signs. Shadows and fixings along the walls showed where the benches would have been fixed on both sides. Vertical escape hatches were reached by cast-iron wall rungs rather than bolted-on ladders. Debris had been dropped down one of the escape hatches in the immediate postwar period. Pairs of empty toilet cubicles were provided in short offshoots off the shelter chambers. All of the shelter's Elsan chemical toilets had been gathered together in one pile, possibly with the intention of collecting them at some stage.

Montage of wall art in the Littlewoods shelter. Photo Ken Geddes

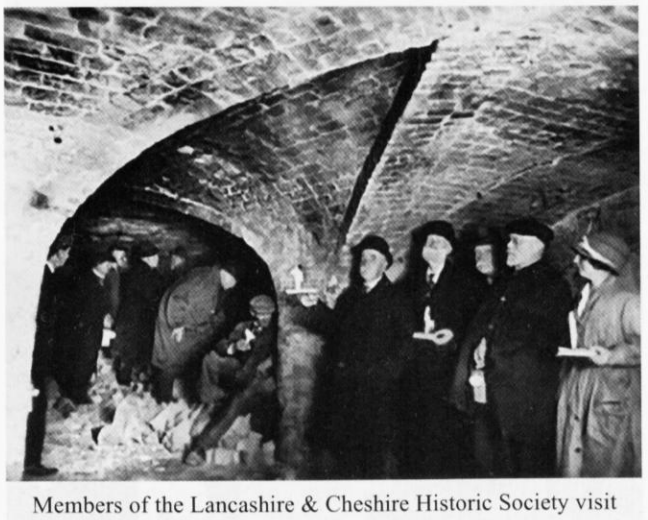
The main target of all visiting on the Sunday were the remarkable murals at the south end of the shelter. These appear to be the work of one artist, maybe even one of the MC5 experts since graphic skills were used by MC5 to adjust and add false information to letters before sending them on. It is likely that the murals are sketches of workers at the factory, designed to relieve the boredom of an anticipated raid and distract shelterers from the bombing outside. Some are identified by their initials. Most are of women, while the men shown are either in uniform or middle-aged, one appearing with a bow tie and one with a pipe.

Writing on the ceiling indicates the dates 1942 and 1943, after the main blitz and before V1 attacks in the southeast, in the era of occasional one-off raids, though the shelter was certainly present in 1940 as it appears on an Ordnance Survey map of that date.

Williamson's extraordinary tunnels

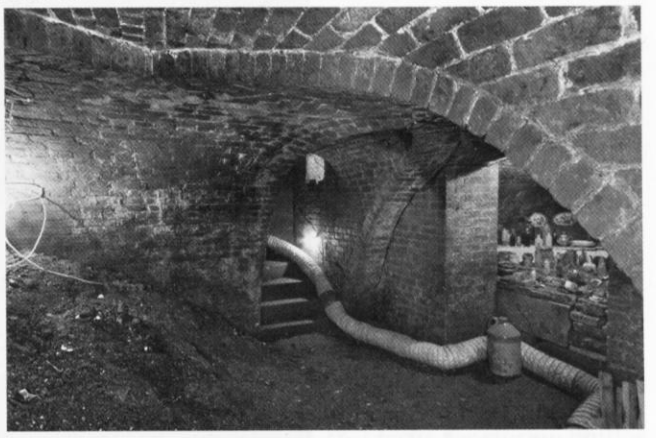
The Williamson Tunnels consist of a labyrinth of tunnels under Liverpool, built on the instructions of wealthy tobacco merchant Joseph Williamson in the first half of the nineteenth century.

In 1805, Williamson acquired an area of land in Mason Street in the Edge Hill district of the city, which was then a largely undeveloped outcrop of sandstone overlooking the city centre. He started to build houses in the road. The ground behind the houses dropped sharply due to quarrying and in order to provide large gardens, which was the fashion at the time, Williamson built arched terraces above some of the quarrying, over which the gardens could be extended.



Members of the Lancashire & Cheshire Historic Society visit the cellars below the four-storey building at the top corner of Paddington and Highgate Street in 1925. A report on the visit in a newspaper of the time stated 'went for nearly a mile before giving up their search for a boundary.' Access was lost when the Paddington Garden flats were built in the 1930s and the cellars were not reopened until July 1999

When these were complete he continued to employ his workmen to perform unnecessary tasks such as moving rocks from one place to another, then back again. It was at this time that he started to excavate his labyrinth of brick-arched tunnels and basements running in various directions within the sandstone outcrop. This bizarre tunnel-building continued until his death in 1840; by that time he was known as the King of Edge Hill. After his death many of the tunnels were gradually filled with rubble.



The middle level at Paddington with steps leading up to the top level. Note the fine brickwork and the typical Williamson arching. Some of the crockery found while excavating the cellars is seen on the right. Photo Nick Catford

The tunnels are to the east of the Liverpool Metropolitan Cathedral in an area bordered by Mason Street, Grinfield Street, Smithdown Lane and Paddington. Their full extent is still not known and many of them are still blocked by rubble. Many tunnels are known to have existed and have yet to be rediscovered while others are little more than rumour and speculation. Nobody knows or will ever know the full extent of this underground labyrinth.

The Friends of Williamson's Tunnels were formed in 1996 with the aim of promoting all matters relating to Joseph Williamson, and in particular locating, excavating and conserving as much of Williamson's underground legacy as possible.

We were able to visit two sites, a three-level basement adjacent to the Williamson Student Village, and the cellars and 'banqueting hall' beneath Williamson's own house in Mason Street.

There had long been speculation that tunnels would exist under the old Paddington Gardens flats which predated the current Williamson Student Village. Not least because it was recorded that when Paddington Gardens was built in the 1930s the layout of the 'estate' was designed to avoid underground voids. The existence of tunnels was also implied in notes written by the Lancashire & Cheshire Historic Society in 1926 which suggested that tunnels existed beneath the four-storey building built by Joseph Williamson around 1836 that formerly stood at the top corner of Paddington and Highgate Street.

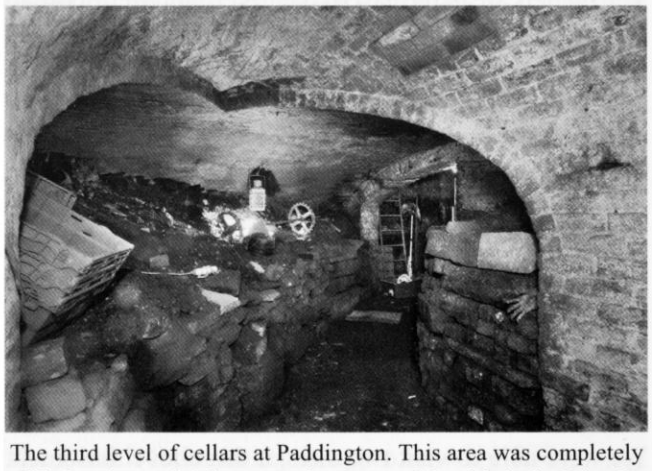
Before the demolition of the old flats started, the FoWT were granted permission from the site owner to carry out an exploratory dig at that corner. In the limited time available a crater was dug which revealed an underground wall built with sandstone blocks, dressed with exactly the pattern seen elsewhere in the tunnels.

Sometime later a newspaper article from 1925 was discovered, describing the LCHS visit and illustrating it with two photographs. The article pinpointed the property above as no. 126 Paddington and reported that the historians "went for nearly a mile before giving up their search for a boundary".

Discoveries are still being made

In July 1999, FoWT carried out a second, larger-scale dig on the same corner and finally broke through into this long-lost section of the Williamson tunnels network; this has now been developed as their primary work site and opened as a tourist attraction. The Friends are hopeful that ongoing excavation at Paddington will reveal a further tier (or tiers) of cellars and a connection to the main network of tunnels under the now demolished houses in Mason Street.

In order to give members the best opportunity to view the current excavation of the cellars at Paddington our small party was further split into two, each with one of the FoWT's expert guides. One group went straight down to the bottom level while the other started at the upper level.



The third level of cellars at Paddington. This area was completely filled to the roof. After removing some of the debris the Friends cut a walkway through the rest which is held back by dry stone walls. It is believed that there are several more tiers of cellars below this level. Photo Nick Catford

A new metal stairway takes visitors down to the first level where we were shown the blocked entrance to a tunnel that will be the subject of future investigation and excavation. From there a flight of original stone steps takes one down to the H-shaped second level. The steps continue down to the present bottom level which is also H-shaped but with one much longer side. Part of this lower level is still filled with rubble which will, in time, be removed. A number of well constructed Gothic arches are still in excellent condition, confirming that Williamson employed very competent builders. During the excavation a large quantity of crockery was found and much of this is now on display through the cellars.

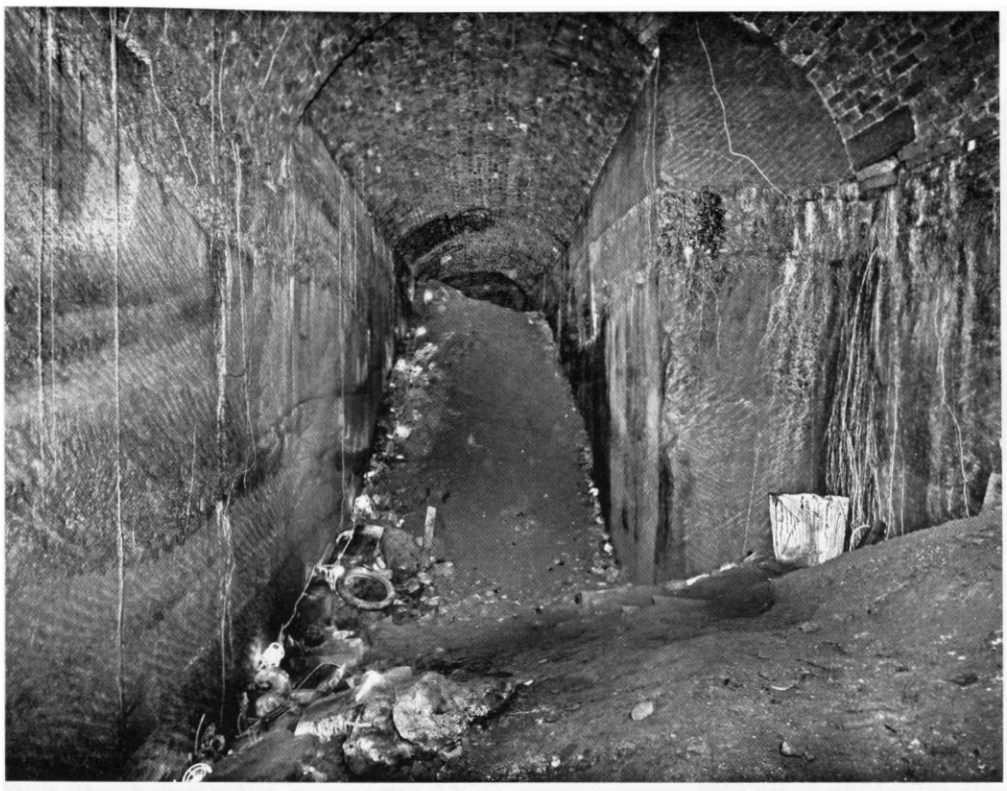
Joseph Williamson's house has had many owners and uses since his death in 1840. Its most recent use was as a commercial premises but it has since been empty for many years. When I first visited in 1998 it was an empty shell but the upper storey, which wasn't original, has now been demolished leaving only the two-storey facade facing onto Mason Street and kept in place by massive steel bracing.

Sub Brit members wait to climb down the 20-foot ladder to visit the banqueting hall. Photo Chris Rayner

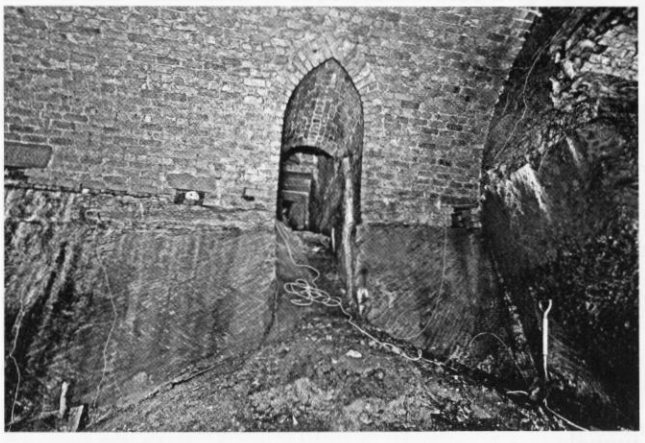
The 'banqueting hall' is probably the best known of Williamson's underground structures as it has been accessible to visitors for many years. Its name might be something of a misnomer as there is no evidence that banquets were ever held here but they may have been – it is certainly big enough. Access is by a 20-foot vertical ladder and to comply with health and safety legislation anyone climbing down the ladder has to wear a full body-harness and be hooked onto a fall-arrester suspended from a tripod above the shaft. It took quite a long time to get people kitted up in the safety gear ready for the descent.

At the bottom of the ladder we were met by one of many blocked arches that must have led somewhere It was a short clamber downhill and a squeeze (for some of us) to a flight of steps through the 'gash' where the walls are natural sandstone with the tool marks of the quarrymen still visible. This brought us into one end of the banqueting hall; at this point we were about 40 feet below ground level.

All the houses in Mason Street have been demolished except Williamson's house where the facade still stands. Photo Nick Catford



The 65ft long banqueting hall; the gash is out of view to the right. Although it is unlikely that a banquet was ever held here a local legend states Williamson had tested the loyalty of his acquaintances by inviting them to a dinner at his house. The dinner turned out to be a poor man's meal of beans and many of the distinguished visitors left in disgust. Williamson then said "I now know who my true friends are" and led the remaining people to a sumptuous banquet. Although the story probably isn't true the FoWT have every intention of holding a banquet there one day. Photo Nick Catford



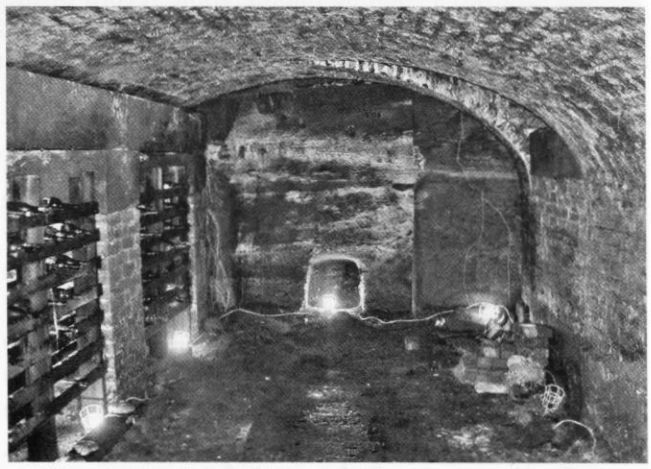
The arch in the side wall of the banqueting hall. By climbing through the arch we were able to see two more blocked tunnels one to the left and one to the right. Photo Nick Catford

The size of the underground chamber couldn't fail to impress despite its being partially filled with two large mounds of rubble; one sloping up to the back wall and the other coming down from another typical Williamson arch in the side wall. The rubble had been poured into the chamber from above by people knocking holes in the brick arched ceiling to dispose of unwanted building material. By climbing up into the arch it was possible to see two more blocked tunnels.

The chamber is 65 feet long but its height must remain a mystery until the rubble infill is eventually removed; one can only guess at what might be uncovered by digging out the chamber to its natural floor. It would come as no surprise to find more tunnels – perhaps a connection to the long-lost triple-decker tunnel which is known to exist.

Having climbed back up to street level, we were able to visit the cellars beneath the now-demolished house including the 'wine bin room'. These were visited by James Stonehouse five years after Williamson's death. He described seeing "... racks for storing bottles of wine". There are huge hand-cut sandstone lintels above them and also an impressive elliptical arch that makes up the roof. There is also another partially blocked arch known as the 'bishop's mitre' that will at a future time be unblocked, perhaps providing access to another part of Williamson's extraordinary labyrinth.

You can't help getting caught up in the energy and enthusiasm of the Friends of Williamson's Tunnels who I first encountered in 1998. They have achieved so much in nearly eighteeen years but I believe the best has yet to be found. They once again treated us proud with a great Scouse welcome and organised a weekend that was a logistical nightmare but went almost without a hitch. Thanks guys.

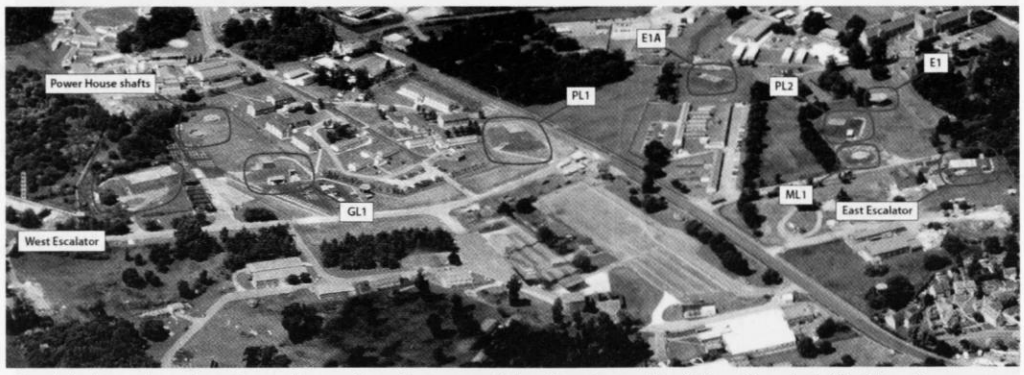


The wine bins below Williamson's house; note the hand-cut sandstone lintels above the bins. The wine racks are more recent and were put there during the making of a horror film *The Cask of Amontillado* in 1998

Corsham's Vast Secret Bunker – a Trip of a Lifetime

Martin Dixon and Marcus Butcher

Some sites are easy to visit and others more problematical. One of the sites that has been most difficult to access is the vast underground complex beneath Corsham in Wiltshire. Some fortunate Sub Brit members enjoyed a unique visit on 13 June 2013.



Aerial view showing the main surface features of the Corsham site GL – Goods Lift, PL – Passenger Lift, ML – Machine Lift, E – Air Intake Shaft (reproduced from *Burlington* by Nick Catford)

Top Secret – Acid

Originally excavated as Bath Stone mines over the centuries, the series of quarries were converted in World War II into protected accommodation. Some were used for storage and an immense underground aircraft factory was built in another. It is postwar, however, that the most fascinating chapter in their history began. The complex housed the top-secret Central Government War Headquarters; so secret, in fact that a special classification of *Top Secret – Acid* was introduced to hide its function.

Over the years the site has had many codenames but is best known as Burlington as this was the codename uncovered by Duncan Campbell, the investigative journalist. For much of Subterranea Britannica's history, the site remained classified – it was only finally declassified at the end of 2004. Since then a few visits have been made and material published. Many Sub Brit members will be familiar with a number of these publications including:

The English Heritage-commissioned Characterisation Study of 2008

Subterranea 22 'special edition' of April 2010 with Steve Fox's superb research

Nick Catford's sublime photographic record of the site, recently published by Folly Books

The earlier (WWII) period of use is well covered in Nick McCamley's book *Secret Underground Cities*.

Fascinating though these publications are, they are no substitute for seeing the site 'in the flesh', so to speak, and Chairman Martin Dixon set himself the challenge of arranging a Sub Brit visit. Almost two years after the original approach, the responsible MoD Head gave the go-ahead – permission for which we are and remain most grateful. In order to allocate places as fairly as possible, a ballot was held among SB members and names were drawn at random.

Marcus Butcher takes up the story....

The trip begins

I was very lucky to be one of the small group getting the chance to visit a site known over the years by many names, including Burlington, Hawthorn, Subterfuge, Spring Quarry, Stockwell, Turnstile, Chanticleer, Peripheral and 3-Site. But the name I was looking for as I drove along was MOD Corsham, as an active base still protects the bunker's secrets.

On my approach to the main gate, I passed a large grassy pyramid mound, little realising that I would shortly be around 100 feet directly below that, looking at a set of two passenger lifts (Passenger Lift 1). As I pulled off Westwells Road into the visitors' car park I could see the top of one of the huge ventilation shafts supplying air to the tunnels below.

Sights like this have always fascinated me – wondering what's down below that needs so much air – and at this point I still had no comprehension of the size of the site we would be visiting today. Once I saw it I understood why such large vents are required. A few minutes before the allotted hour, all the Sub Brit members had arrived and were getting suited and booted.

Security was pretty tight – after showing photo ID in the security area we were granted car and personal passes as escorted visitors. We parked in a small car park on the other side of the road from the main site and then crossed back over to a pedestrian entrance. We went to the Global Operations Security Control Centre (GOSCC) security desk and signed in again to visit the underground tunnels.

A passing RAF officer expressed surprise and obvious envy that we were being allowed down into the bunker – visits like ours are few and far between. From this desk we could see further into the grounds of MOD Corsham – across the landscaped gardens the top of another huge air vent was visible, this one constructed with weak walls but a solid roof so that the vent would be sealed if struck by a bomb.

We left the security desk and crossed the car park to the current main shaft entrance; as we walked we were directly over the Box railway tunnel where London to Bristol trains run east to west. We passed the top of more signs of a bunker on the way (one of these was possibly just the top of an air shaft for the tunnel). The Box Tunnel east portal is a Grade II listed building – a

side tunnel leaves the main track into Tunnel Quarry at that point. But already I'm getting ahead of myself.

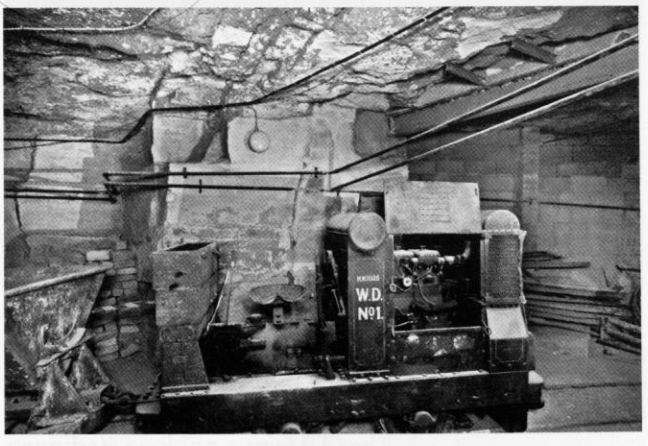
Going underground

Once we entered the deceptively small surface building, we found ourselves within a small room with two lifts to our left and some very solid looking (closed) metal doors to our right. We took the PNCC (Primary Network Control Centre) lift down to Q Level; it almost seemed like a dream or something out of a James Bond movie. On emerging from the lift, we entered narrow white corridors with large warning signs on the wall – asbestos, Radon and toxic spores are all present in various areas of the complex although we were assured that we wouldn't be entering any particularly hazardous zones.

We watched a short health and safety induction film that covered fire safety and a number of other topics, then everyone in the group was issued a re-breather unit. Fire safety is taken seriously within the site and recent local history would suggest this is sensible. In 2009, a five-acre underground storage facility (containing MOD surplus equipment) was affected when an electric forklift caught fire – this was in part of the 18-acre site in Monk's Park (just a few miles away from MOD Corsham) owned by Leafield Logistics. The site had been a Royal Navy depot in the past and Monk's Park Quarry before that.

We were introduced to Pete and Jim – the Mine Manager and his Deputy, who were devoting their day to showing us as much of the complex as possible. As we set off through the tunnels, one of them quipped that we'd be like kids in a sweet shop, with so much to see – and then apologised for the joke. To be honest, he was absolutely right, there was so much here that is of interest to Sub Brit members that we could easily have explored around the site for a week and still have wanted to keep going. I heard more than one member of our group refer to Burlington as the 'Holy Grail' subterranean site to visit!

Loading munitions at the north platform during WWII. Photo from Nick McCamley collection



One of the two surviving Ruston narrow-gauge diesel locomotives, the other has been cannibalised for parts

Tunnel Quarry

We started our tour with a visit to Tunnel Quarry, used for ammunition storage in World War II. When in production as a quarry, stone that had no economic value ('deads') was simply dumped in old workings or used to reduce the height of passages. This is common practice at most mines as it dramatically reduces costs. When Tunnel Quarry and others were converted to wartime use, the biggest cost was the removal of literally millions of tons of waste stone. This was done with a two-foot-gauge railway and the first historical thing we saw was a Ruston narrow-gauge diesel locomotive. In total 54 of these locomotives were used on the site, which gives an idea of the scale of the operation.

During operation as a depot, extensive conveyer belts were installed along all the main routes and we passed many of these (some of whose belts were later transferred to Monkton Farleigh). Much of the floor surface of the tunnels was covered in a hard bitumen surface, designed to minimise any danger of sparking. The imprint of shell cases in this coating could still be seen – dents caused during loading or unloading.

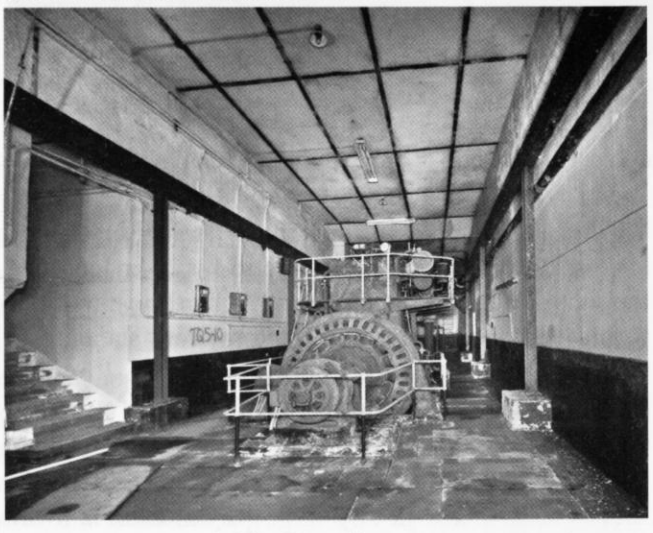
We then headed off along one of two parallel full-length loading platforms (the north platform 1 is 204m long, and the south platform 2 is 173m long) where the munitions would have been transferred across from standard to narrow-gauge track and onto conveyors. Roughly halfway along the platform, we passed the conveyor control room. Next we walked along the standard-gauge railway tunnel (which branched off the GWR main line into the Tunnel Quarry munitions depot).

As we walked along we occasionally heard a train travelling through the Box tunnel proper – our guide pointed out that it was only 20 metres away from where we were walking. We soon came to the first of the emergency exits (Emergency Exit A, which was

The 204metre-long munitions loading platform looking into the depot. The building on the platform (left) is the despatcher's office, the railings visible on the right are on the bridge where the railway crosses the Main East conveyor tunnel. Photo Nick Catford

previously an escalator) – with approximately 150 steps up to the surface. Water seepage drains into a lagoon which we saw but couldn't explore without a boat! The lagoon drains under the active Box Tunnel and is regularly inspected. We passed the still-operational sewage ejector plant unit which occasionally burst into action.

We followed the mainline tracks and found ourselves at a turntable with three bays for servicing over inspection pits. We also passed the junction for an underground siding. In many areas we could still clearly see the original tool marks where the quarry had been cut by hand. There were vast tunnels leading off on each side as we walked along and I must admit I was fascinated by the various walled-off doorways and passages and wondered how much more there was to be seen.



The Powerhouse

We entered the 'powerhouse' where two large diesel generators were slowly rusting away, along with the overhead winch gantry. Next, we followed another conveyor belt through Number 2 District ammunition storage area (itself around five acres!) until we reached barracks built by the Royal Engineers. It is difficult to convey the enormity of the place – and we hadn't even entered the Government HQ yet!

Underground Barracks

The underground barracks were provided for workers around 1940 but are not believed to have been heavily used. However they provided accommodation for around three hundred and we passed a number of dormitories, toilet blocks and ablutions. The barracks were provided with their own kitchen area and as it is a less humid area than most of the site, this is currently used as a storage area for books and other printed materials. These have been rescued from Burlington itself and give an idea of the range of material that would have been available.

One plan was labelled *DOE Hawthorn LV Quarry Mains Records – Tunnel* and the number of maps would have rivalled Stanfords! I had a quick look through the stacks of maps and saw a diverse set of plans including Barnsley, Basra, Torquay, Kerman and Al Jawf. It was very warm in this area as a result of current day air-conditioning.

Before we rushed through to the next area I only had time for a quick look at a couple of books, and spotted the September 1960 edition of the *Radiological Health Handbook* published by the US Department of Health, Education and Welfare Public Health Service, and a copy of *Public General Acts and Measures of 1959.* Others included Parliamentary Lists, the *RAF Year Book* and shipping charts. In the corner was a selection of radio and testing equipment – also rescued for safe-keeping

Into Spring Quarry

We then moved on to the six-shaft emergency exit, where there are apparently 205 steps leading up to the surface. Fortunately, we didn't have to go up all of these steps for our lunch – instead we went back to the modern section. After walking around in dimly lit corridors or completely dark rooms, it was a bit of a shock to return to the well-lit corridors and the current-day canteen.

The CDI fan

We quickly refuelled in preparation for our return to the tunnels and worked out as a group and with our guides

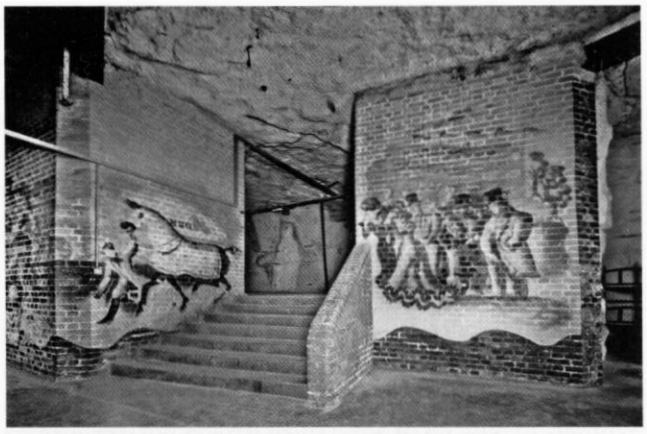
how much of Spring Quarry we would be able to visit in the time we had left. Some of the possibilities mentioned were the murals, the GPO exchange, the BBC studios, the Holborn escalator, the CDI fan, the hospital and the West Lung. Neither the Strategic Reserve nor the UFO section got a mention – if they had then I think we'd still be down there looking!

Jim took us back into the tunnels and we went straight to the CDI fan. I heard three different names for the CDI (Corsham Depot Inlet) fan; I also heard it described as the Clift Drift Intake fan and Clift Distribution Inlet fan. The fan is huge (160 inches) and is capable of circulating 400,000 cubic feet of air per minute. It draws air from the old Clift workings outside Tunnel Quarry, hence its aliases.

Next, we were off to see the murals – I wasn't sure what to expect of these and just thought there would be a few pictures painted by people working in the tunnels. I was surprised to find out that an artist named Olga Lehmann had been hired in 1943 to paint the murals in the canteen and surrounding areas with the aim of boosting morale for people who found themselves having to live underground for long periods. Olga Lehmann was Emmy-nominated as a costume designer for films such as the 1976 version of *The Man in the Iron Mask* and *The Four Feathers* (1977). Many of the murals still survive and seem to be in very good condition (where they haven't had a wall built through them or had equipment put up in the middle of them).

One of Olga Lehmann's murals

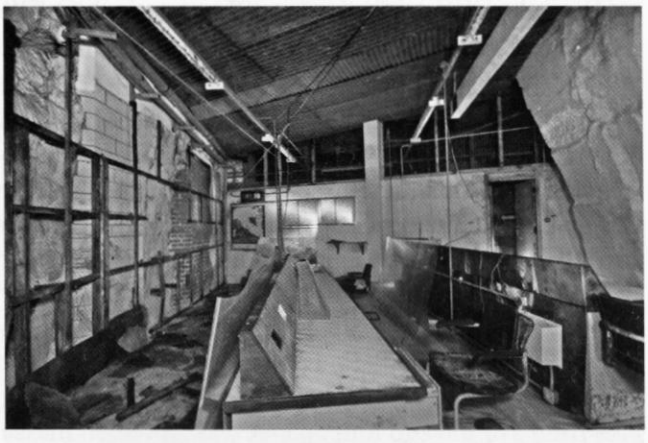
The canteen was in total darkness so I wandered about flicking my torch on blank walls before finding the first mural of people drinking beer and generally having a good time, with a village and hills in the background – mostly shades of blue and red but certainly a striking picture (it turns out that the paint most available was RAF 'surplus'!). I continued to walk around the cavernous rooms and saw many amusing scenes including men playing dominoes; a bride chasing an escaping groom; a boxing match where a small man is knocking out a giant; cannibals cooking a missionary; three barmaids pulling pints, and a variety of scenes of horseracing. These all date from when Spring Quarry was a vast underground



The former Bristol Aeroplane Company's WWII canteen was designated as open-plan dormitories for junior staff working in the adjoining government offices. Many of Olga Lehmann's murals are found here

Bristol Aircraft factory, although production only reached a fraction of its true potential.

Much of the area was reused as the RAF Quarry Operations Centre – a communications hub greatly expanded during the Cold War. At this time the wartime canteen area was converted into a dormitory so survives more intact than areas which were sub-divided. A more recent kitchen area still exists and there were a few store rooms around its edges. A few items still remain, including NBC (now CBRN) protective clothing kits and stacks of mess tins. A lot of fungus trails were present on the walls in these areas and we avoided disturbing them so as not to release spores into the air.



The Quarry Operations Centre which was established in the 1970s

As we walked to the next location the sound of drilling echoed along the tunnels; there was clearly work going on somewhere but we'd seen very few people around so far – a few had passed us on electric carts but it wasn't clear where they were going. We made our way into another kitchen next, filled with items that wouldn't seem out of place in any large professional kitchen nowadays – an upright toaster, hot-water urns, stacks of crockery – it all looked fairly normal apart from the light box on the wall with sections such as 'Air Attack', 'Bikini/ Tahiti Red' and 'Counter Surprise State Scarlet' written on them.

One wall in the kitchen displayed a poster explaining the different NBC dress categories – *zero*, with no NBC worn but carried or readily available; *one*, where you have to wear NBC but with the hood down; *two*, wear the NBC with hood down and overboots on; *three*, wear NBC with hood up, plus overboots and gloves; *foxtrot* where you add the facelet; and *romeo* where you would also wear the respirator.

Central Government War Headquarters

At last we entered the core of Burlington proper and we were all pinching ourselves. We passed the current (pun intended!) vehicle-recharging station where a few carts were charging up and then we walked along 'West Main Road' to Passenger Lift 1. As we headed onwards the sound of Pink Floyd's *Dark Side of the Moon* echoed along the corridors – some contractors obviously providing some light entertainment. This sounded rather eerie in the darkness yet somehow appropriate as we walked along corridors that remind one of a rather bleak part of our history.

We saw the huge key room, with racks and racks of neatly labelled keys, giving an indication of the vast number of doors and stores. Next we entered a room filled with Lamson Engineering Co. Ltd message tubes (similar to the ones you used to see in old-fashioned stores and even in today's supermarkets where the cash canister is sent up a pipe) – the pipes ran along the ceiling of many of the passageways between offices and would have been a quick and reasonably secure method of sending documents from one office to another. The technology is familiar but once again the scale massive.

After walking along 'East First Avenue' and 'East Second Avenue', we found ourselves in the Prime Minister's Room, linked to a Briefing Room and Comms room – to one side was a small stack of chairs still wrapped in their original protective covering. The next cavernous room had piles of packs of paper – literally tonnes of paper that would have kept the civil servants well supplied for working underground. Part of the cover for the site when it was operational is that much of it was a government store – hence all furniture, documents, and everything else from ash trays to toilet paper was stored en masse to maintain the pretence. Whether everything would have ended up in the right place on mobilisation is an interesting question!

Catering for all tastes

We walked through a small café area with two large coffee machines in the centre; on the far side of this room we entered yet another kitchen, much bigger that the last one – there was a wash-up area to one side and various bits of equipment including deep fat fryers, a mincer, some huge cooking pots, several giant ovens, and a number of *Frozt-ed-aer* walk-in refrigerators made by the Crowthorn Engineering Co. Ltd of Stockport. We carried on through to a laundry area and saw a *Corrujet 65* industrial washing machine, boilers, tumble-driers,

Two views of the kitchen

irons and the biggest mangle I've ever seen – a couple of Singer sewing machines were still in the corner but there would have been many more of these for all the repairs that would have been needed for the clothes of thousands of workers.

We passed a set of padlocked doors as we headed back out onto 'East Second Avenue' – there were several areas like this that we passed during the day and I couldn't help but wonder what was behind them. My understanding is that individual sections were kept relatively isolated so that information flows could be actively managed. In any case, to have visited every square metre would have taken weeks.

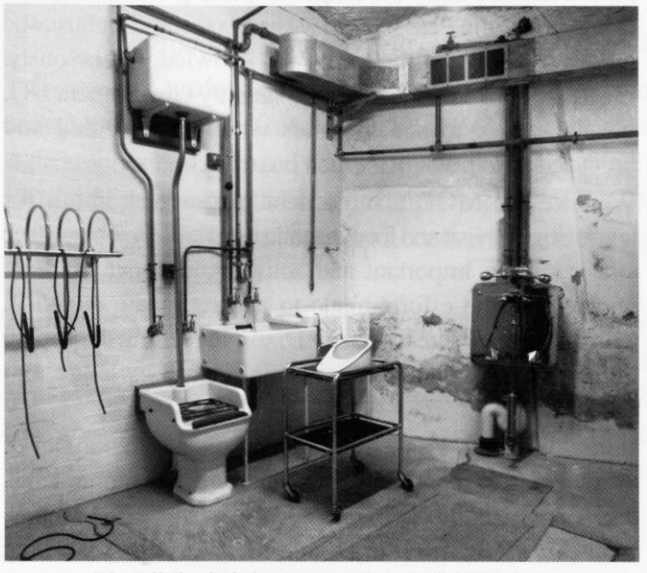
Passing ML1 (Machinery Lift 1), we arrived at an escalator where we stopped for a group photograph. The escalators date from World War II and were requisitioned from London Underground. During its wartime use as an aircraft engine factory there would have been several thousand workers and quick entry and exit would no doubt have increased productivity.

We quickly visited the water treatment room where in addition to huge holding tanks and filters there used to be underground reservoirs – now long drained. Next on the schedule was PL2 (Passenger Lift 2) which had two lift cars, both at the bottom level. We were able to climb into these although they weren't perfectly aligned and view up the immense shaft. The lift lobby area has been set aside as a small 'museum', displaying quarrying equipment from the days when this site was just used as a source of high-quality Bath stone. There are photos, plans and tools – thoughtfully assembled by one of the previous MoD Mine Managers.

In Sickness and in Health

Next we made our way to the hospital wards which were instantly recognisable with swinging double doors and a much higher standard of finish to the walls than we'd seen in the other areas. A large map of the Bristol aircraft factory seemed a little incongruous sitting on the floor of the first hospital room but other items seemed at home here, especially in the sluice room which was still fairly well equipped for rinsing and sterilising medical equipment.

There was another pile of blueprints stacked in one corner – I had a quick look as we hurried through and saw plans for alterations to the galley at HMS *Royal Arthur* – the naval leadership-training establishment where Philip Mountbatten (now Prince Philip) was once a trainee.



The clinical sluice room. Photo Nick Catford

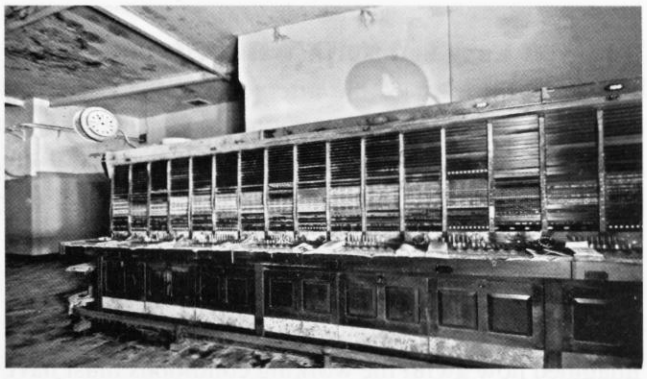
The Hospital was a microcosm of what you might expect above ground. An examination room, office, X-Ray room, dispensary, kitchen and linen cupboard all frozen in time and fated never to see patients. Some sealed boxes of crockery, dated 1957, were sitting in one of the rooms which appeared to have originally been the drugs store.

We went from the hospital to the GPO telephone exchange – the first thing I noticed here was the vinyl flooring which hadn't been used in any of the other areas (they were either bare stone or concrete) – it would have looked very impressive in its day and, to be honest, has lasted very well although it was clear that a lot of water had entered this room at some point in the recent past.

The two exchanges run in parallel along the room and have been covered in plastic to protect them from water damage. Through the plastic, I could just make out a poster titled *Secrecy of Telephone Calls*, which read:

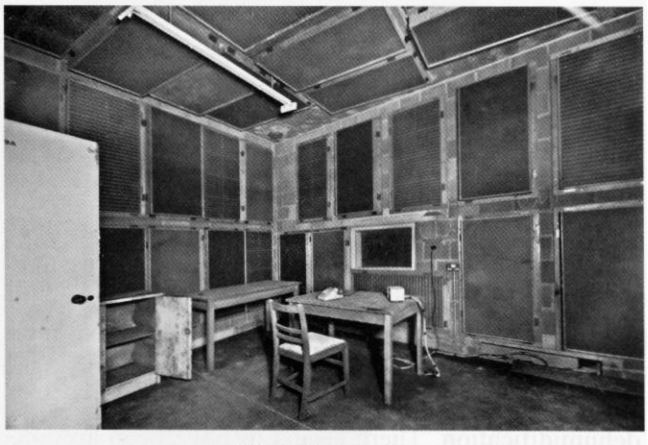
> "Every member of staff should understand that he or she must treat in strict confidence any telephone conversation, or part of a telephone conversation, overheard in the course of duty. To reveal the nature of any conversation, even to a colleague, will incur the risk of severe punishment. The fact that a telephone call has been made or received by a particular party is also confidential. It is, in fact, an offence under the Telegraph Act 1868 for a post office servant to disclose, make known or intercept, contrary to his or her duties, the contents, or any part of the contents of any telephone message, and an officer convicted of the offence is liable to a sentence of imprisonment."

We passed several headsets hanging up and saw cupboards full of spares. Most of the jack-plugs in the exchange still had protective covers on them. Although the deterioration here over recent years has been significant, the quarry team hope to be able to stabilise this if funding can be agreed. In addition, two of the switchboards have been taken to the surface and restored and now occupy a proud display position alongside the current reception desk.



The telephone exchange has deteriorated in recent years

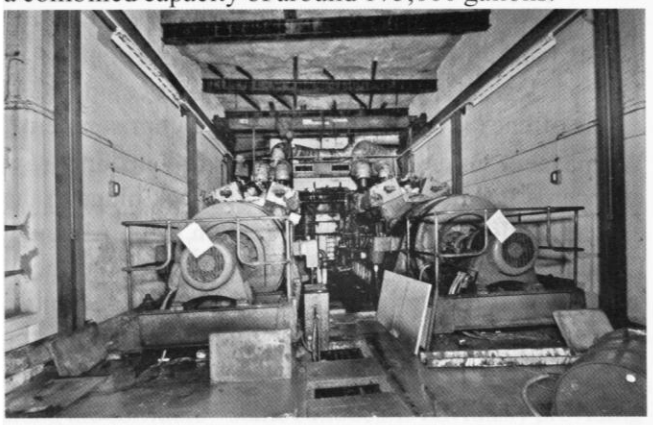
We pressed on until we reached the BBC studio. This was superficially similar to the studios in Regional Government Headquarters but the fact that the nation would be broadcast to from this very site in the event of nuclear war makes it very special. We saw another escalator – this one had been removed from St Paul's station on the London Underground, and another had been removed from Holborn station but was later returned.



The BBC studio

We had a quick look at the currently used goods lift (GL1) on our way through to the generator room where four huge generators sat in the darkness – it was mentioned that these may have come from a naval vessel but no further details were available. The manufacturer was

Mirrlees and the output supply was 11KV. We were able to follow the exhaust pipes to a nearby shaft which led up to the surface. We also saw diesel storage tanks with a combined capacity of around 175,000 gallons.



Two of the Mirrlees generators; the other two are in an adjacent bay

The West Lung and North West Drift

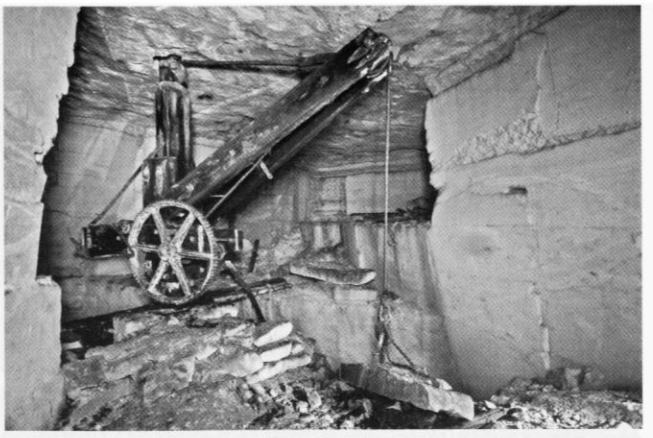
Having spent most of the afternoon in the Cold War development of the site, it was time to go backwards in time. We carried on into one of the older parts of the site, the West Lung – so called as it provided one of the key air supplies.

We walked for quite a long time through passages with less and less recent intervention until we reached a quarry face where the hand-powered cranes still stand. I imagined how awful the working conditions must have been for the men who would originally have been down here cutting the oolitic limestone with hand-tools in the heat and dust, but was quickly distracted when I noticed a mysterious sign painted on the wall which read "G Sawyer OBE MD 1852". Other graffiti appeared to be records of stone cut – possibly for payment purposes.

Many Bath Stone mines still retain their old wooden cranes, but to see five cranes in amazingly good condition in such a small area showed that production here was still in full swing when the site had been requisitioned in December 1940, and work had stopped immediately. In a way it was more instructive to see this aspect of the site at the end of the day as it brought home its roots – roots which would probably have been eclipsed had we viewed the phases in strict chronological order.

Our final visit of the day was to the northwest 'drift' which has only recently been taken out of commission – this would have provided additional air into the winding warren-like system we had spent almost seven hours walking around. As well as the ventilation fans, there were air filters and what appeared to be heaters for dehumidification. There seems to have been an outer 'curtain' of air passages, fed into the complex around the perimeter to provide a balanced air supply.

At that, time was up and we reluctantly made our way back to the surface. Even after so long spent underground, I'm sure we only saw a fraction of what remains buried under the quiet little village of Corsham.



One of the surviving cranes

Conclusions

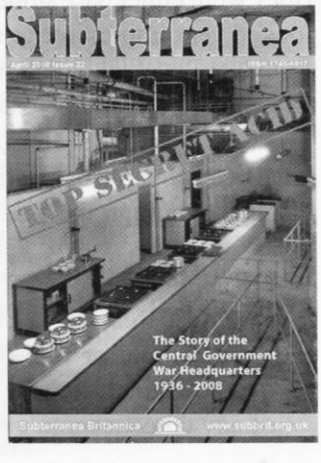
Having had certain expectations about the visit, they were all exceeded. Firstly the length of the trip was a very full day. Secondly, in Pete and Jim we had expert and enthusiastic guides who gave of their time and knowledge generously. Lastly, as well as the core of the standby Government HQ, we were able to see the sites which surrounded and preceded it, to put it in a much broader context.

We owe the MOD a huge debt of gratitude, both for approving our visit and for executing it so skilfully. The surface site is still an important and active military site and we appreciated the efforts made to accommodate our visit. Thanks also are due to Martin Dixon for setting the trip up and to fellow members for their own knowledge and contribution.

Earlier this year, English Heritage designated a number of areas within the complex as scheduled ancient monuments. These include the telephone exchange, the BBC studios, kitchens, the Lamson room and the West Lung working quarry area. This level of protection is the same as Stonehenge and the Tower of London enjoy and though not a guarantee of preservation, can only serve to increase the chances that this unique site is retained for future generations to wonder over.

I know that the site will still remain at the top of many members' wish lists. In the short term further visits are unlikely but in the fullness of time, who knows. In the meantime I hope this trip report goes some way to conveying the unique and magical atmosphere of the site.

Subterranea 22 is a special edition devoted entirely to the Central Government War Headquarters at Corsham. This issue has been out of stock for several years but it has now been reprinted and is available from the Sub Brit shop for £6 plus postage http://shop.subbrit.org.uk/ Payments can be made by Paypal or credit/debit card.



Discounted Cotswold Shopping

Cotswold Outdoor have granted Sub Brit members a 15% discount on their products (excluding sales and special offers). The details are included in a letter on the website at

www.subbrit.org.uk/docs/discount-cotswold-outdoor.pdf

If you are not able to access the website, then please contact us with an SAE for a copy of the letter.

The discount code can be used in any of their 58 stores (there is a barcode on the letter), and for telephone and online orders.

**** Please do not share or abuse the code as this may lead Cotswold to withdraw it which would be a great shame and spoil things for the rest of our members. ****

Here is an introduction from David Hague of Cotswold:

"Cotswold Outdoor are proud to be a supporter of such a prestigious organisation as Sub Brit. As most of your members are aware, Cotswold Outdoor is a multi-award winning retailer with numerous thriving stores located nationwide. Not only are we proud of our knowledgeable staff, but our stores stock one of the most comprehensive ranges of outdoor clothing and equipment in the UK. With a huge range of footwear, waterproof jackets and fleeces, tents, sleeping bags and outdoor accessories, we offer one of the best selections of clothing and equipment right on your doorstep.

Whoever you are and whatever you need, when you shop with us you can be assured of expert, award-winning service and advice that comes from 40 years of experience in retailing. We're really looking forward to welcoming you to our store, online or over the phone soon. I hope that our discount helps your members purchase the right kit and equipment as they continue with their important and valued pastime. We are passionate about giving the right advice and recommending the right clothing and equipment so you can have peace of mind while out in (or should that be under!) the field."

Subterranea 34 will be published mid-December 2013

and the following features are planned to be included

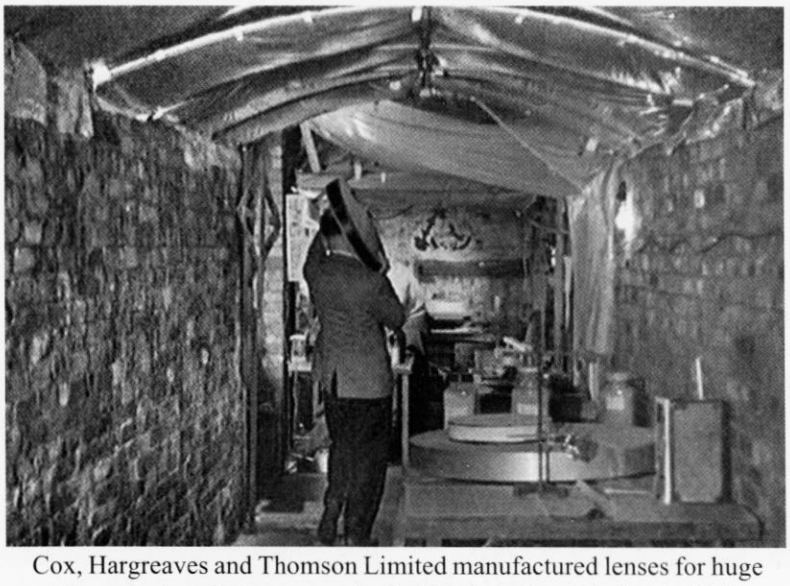
Sub Brit visit to Alderney

Surrey Deep Air-Raid Shelters Part 2

The operation, closing down and after-use and present state of the shelters will be considered

NAMHO Conference 2013

Grebe Swallet Lead Mine



Cox, Hargreaves and Thomson Limited manufactured lenses for huge telescopes in a factory set up in the Brighton Road shelter in 1949.

M.D.H
37

WEST MAIN ROAD
PASSENGER
LIFT Nº1
EMERGENCY
EXIT